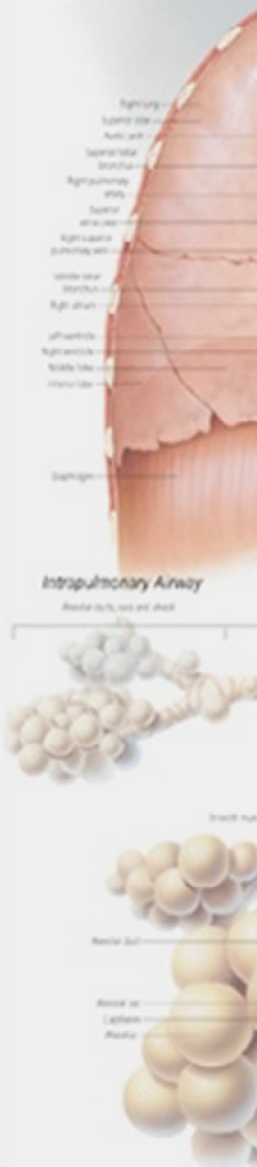




Respi Syste

The Mechanics of Breathing

During inspiration, the diaphragm moves down as it contracts, and the intercostal muscles lift as they pull the ribs outward. These actions increase the volume of the chest cavity. A partial vacuum is created by the additional space, and air is drawn in to equalize the pressure. During expiration, the intercostal muscles relax, contracting the chest cavity. The lungs passively recoil and air is pushed out of the lungs.



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Inhaled Air

nasal cavity or
oral cavity and
larynx

(superior view)



(superior view)



(superior view)

nasal cavity or
oral cavity and
larynx

(superior view)

nasal cavity or
oral cavity and
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Branchopulmonary Segments

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I n t r o d u c t i o n

In any chest subject

1- Definition:- Only description **except** COPD - Bronchiectasis - Br. Asthma.

2- Aetiology :-

Primary:-

Secondary:- from the 4 surrounding structures

Lung	Spread from the lung diseases as pneumonia, TB, Lung abscess, infarction malignancy or asbestosis
Pleura	spread from the pleural diseases as pleurisy or empyema
Mediastinal	spread from the mediastinal diseases as pericarditis, mediastinitis or malignancies
Chest wall	spread from the chest wall as fracture ribs or osteomyelitis.
Sub-diaphragmatic	spread from behind the diaphragm as amebic or pyogenic liver abscess, subphrenic abscess or pancreatitis

3- Clinical picture:-

Symptoms

- Asymptomatic
- Cough
- Dyspnea
- Pain
- Features of the cause
- + Toxic features in infectious diseases (pneumonia and SLS)
- + expectoration in SLS.

Signs

A) General :-

- Features of the cause
- Toxic features (F.A.H.M.)
- Features of the complication

B) Local :-

Inspection

<u>Inspection</u>	shape + resp. movement
<u>Palpation</u>	trachea + TVF
<u>Percussion</u>	lung and special areas
<u>Auscultation</u>	- Breath sound - Additional s - V. R. - Special test

1 - Shape of the chest

- Unilateral retraction = fibrosis - collapse
- Unilateral bulge = pleural effusion – pneumothorax – unilateral emphysema

2- Respiratory movement limited in all chest diseases

Palpation

1- Trachea :- clinically central

- shifted to the same side = fibrosis – collapse
- shifted to the opposite side = pleural eff. – pneumothorax – unilateral emphysema

2- T.V.F.:- tactile vocal fremitus - reduced in all chest lesions

Except 3Cs:-

- Consolidation
- Collapse with patent bronchus
- Cavity if superficial and surrounded with consolidation

Percussion Lung - normally **resonant**

Hyper-resonant :-	Dullness:-
- Emphysema	- consolidation
- Pneumothorax	- collapse - fibrosis
Tympanic R:-	Stony dullness :-
- T. pneumothorax	- pleural effusion

Auscultation

1 - Breath sound:-

1- Vesicular breathing (VB) = soft (rustling) - no gap - Insp. > Exp.

- Vesicular with prolonged expiration (**harsh V**) in **obstructive pulmonary diseases**

2- Bronchial breathing (BB) = hollow sound with gap + Insp. ≤ Exp.

= **normal on trachea**

- + **3Cs** - Consolidation - Collapse with patent bronchus
- Cavity if superficial and surrounded with consolidation

2 - Additional sound:-

Rhonchi:- continuous musical sound

- = in any bronchial obstruction (Br. Asthma - obstructive pulmonary diseases)

Crepitation:- interrupted moist sound

- = - Consolidation
- Lung abscess
- Bronchiectasis
- Pulmonary oedema

Rub:- friction gritty sound caused by pleurisy , disappear by holding of breath

3 - Vocal resonance:- as TVF but heard by stethoscope

Reduced in all chest lesions

Except:-

- 3Cs** - Consolidation - Collapse with patent bronchus
- Cavity if superficial and surrounded with consolidation

4 - Special test:- as

- post tussive suction = collapsible cavity
- succession splash = hydro-pneumothorax
- coin test = tension pneumothorax

4- Complications:-*The usual complications*

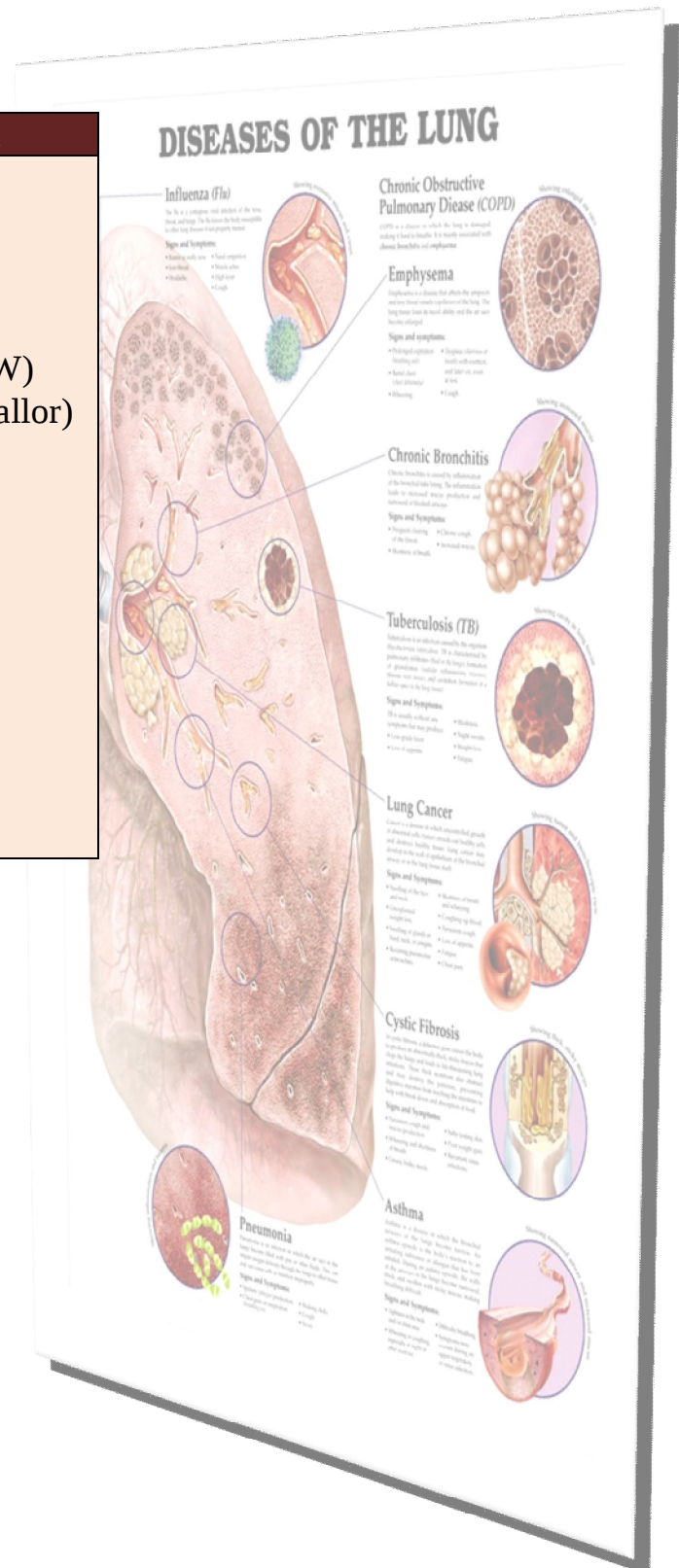
Intra-thoracic	Extra-thoracic
1- lung :- - Pneumonia - L. abscess - Haemoptysis 2- Bronchi - bronchopneumonia - bronchiectasis 3- Pleura - all diseases 4- Mediastinal:- - mediastinitis Late:- - fibrosis and collapse - <u>±</u> fistulae	1- acute sepsis:- - septicemia - septic shock 2- chronic sepsis:- - anorexia (loss of BW) - anaemia (fatigue -pallor) - amyloidosis (renal) - Clubbing - <u>±</u> DIC

5- Investigations:-

variable with stress on
images

6- Treatment:- variable**in any infectious diseases (4)**

- 1- General
- 2- Symptomatic
- 3- Specific
- 4- ttt of complication



Pleural diseases

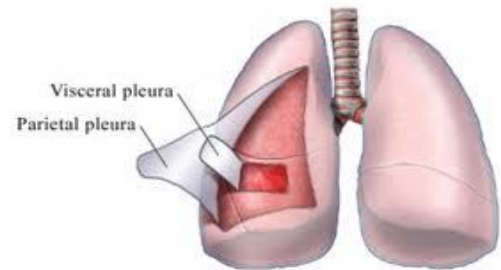
Pleura is a potential space containing about 20 cc of fluid Formed of

Parietal pleura:-

Following the systemic circulation and contains sensory nerve

Visceral pleura:-

Following the pulmonary circulation and contains no sensory nerve



1- D r y p l e u r i s y

Definition :- inflammation of pleura without fluid formation

Aetiology :-

A) **Primary :-** (4I+ 3post + 2 M)

- Infection :-
 - Viral - bacterial - fungal - TB
- Idiopathic
- Immunological
- Myocardial infarction with early complications
- Post-infarction syndrome (Dressler's syndrome)
- Post-cardiotomy
- Rheumatic fever
- Metabolic :- uremia
- Malignant
- Traumatic
- Familial Mediterranean fever

Viral infection (Bornholm) **pleurodynia**

- With coxsackie B virus
- Characterized by spontaneous regression but recurrent
- Affection young adult

B) **Secondary:-** from the 4 surrounding structures

- 1- **Lung :-** spread from the lung diseases as pneumonia, TB, Lung abscess, infarction malignancy or asbestosis
- 2- **Mediastinal :-** spread from the mediastinal diseases as pericarditis, mediastinitis or malignancies
- 3- **Chest wall:-** spread from the chest wall as fracture ribs or osteomyelitis.
- 4- **Subdiaphragmatic:-** spread from behind the diaphragm as amebic or pyogenic liver abscess, subphrenic abscess or pancreatitis

Clinical pictures**Symptoms (Pain + FAHM)**

- Asymptomatic
- **Pain**
- Features of the cause
- **Toxic features** as fever, anorexia, headache and malaise
- Features of the complications
- Cough
- Dyspnea

Pleuritic chest pain:- Sudden **stitching** pain

- **Localized**
- **Referred** if diaphragmatic plura affected to the shoulder or upper abdomen via phrenic nerve and intercostal nerves
- **Increased** with inspiration, coughing and straining
- **Decreased** with holding breath and lying on the affected side

Signs**A) General :-**

- Features of the cause
- **Toxic features (F.A.H.M.)**
- Features of the complication

B) Local :-

Inspection	- Resp. movement:- limited
Palpation	- Tenderness - Trachea:- central - TVF:- normal + palpable plural rub
Percussion	- Normal with tenderness
Auscultation	- Breath sound :- decreased - Additional s. :- Pleural rub - V. R. :- normal

Pleural rub:-

Def:- superficial gritty high pitched sound caused by friction of the pleural layers.

Disappears by holding breath

Should be **differentiated** from

- **Pericardial rub :-** never to disappear
- **Stethoscope friction:-** disappear by firm pressure

Complications:- - Pleural effusion - Pleural fibrosis in recurrent cases

Investigations:-

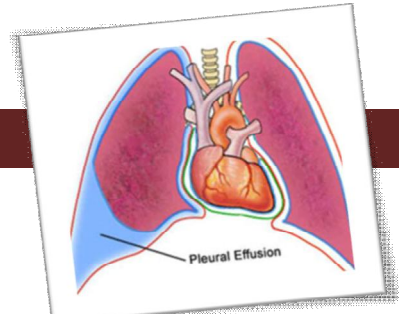
X-ray	- Usually normal - May detect the cause - Early detection of pl. effusion formation.
--------------	---

Differential diagnosis

- Other causes of acute chest pain

Treatment:-

- Treatment of the cause
- Relief the pain by
 - Ask the patient to lie on the diseased side
 - Oral analgesic as indomethacin 25 mg tds
 - Injection of local anesthesia.

**2- P l e u r a l e f f u s i o n**

Definition :- accumulation of fluid in the pleural sac

Aetiology :- It depends on the nature of fluid

1- Exudate (serous)

2-Transudate

3-Haemorrhagic

4-chylous

1- Pleural exudate (serous effusion)**As causes of dry pleurisy**

A) Primary :- (4I+ 3post + 2 M)

- Infection :-

Viral - bacterial - fungal - TB

As a part of primary TB or extension from TB lung

- Idiopathic - Immunological
- Myocardial infarction with early complications
- Post-infarction syndrome (Dressler's syndrome)
- Post-cardiotomy - Rheumatic fever
- Metabolic :- uremia - Malignant
- Traumatic - Familial Mediterranean fever

B) Secondary:- from the 4 surrounding structures

- 1- Lung :-** spread from the lung diseases as pneumonia, TB, Lung abscess, infarction malignancy or asbestosis
- 2- Mediastinal :-** spread from the mediastinal diseases as pericarditis, mediastinitis or malignancies
- 3- Chest wall:-** spread from the chest wall as fracture ribs or osteomyelitis.
- 4- Subdiaphragmatic:-** spread from behind the diaphragm as amebic or pyogenic liver abscess, subphrenic abscess or pancreatitis

2- Pleural transudate (hydrothorax):- (causes of anasarca)

- Heart failure (RVF), constrictive pericarditis, pericardial effusion
- Liver cell failure may be a transmission from ascites
- Nephrotic syndrome
- Severe malnutrition
- Meigs syndrome
- Myxedema

3- Haemorrhagic effusion (haemothorax):- (4Ts+)

- Trauma:- by penetrating wound or iatrogenic during thoracentesis
- Tumors:- primary or secondary
- Tuberculosis
- Telangiectasia
- Haemorrhagic blood diseases
- Pulmonary infarction
- Rupture of aortic aneurysm (very rare)

4- Chylous effusion (chylothorax)

- Obstruction of the thoracic duct:- tumors – lymphadenopathy - filariasis
- Injury of the thoracic duct:- surgery or trauma.

Clinical pictures**Symptoms:-**

- Small effusion:- - Asymptomatic
- Large effusion:- - Dry Cough - Dyspnea - Dull aching pain
 - Features of the cause:- eg TB
 - Features of the complications :- eg 2ndry infection (FAHM)

Signs**A) General :-**

- Features of the cause - Features of the complication
- Respiratory distress in massive effusion

B) Local :-

Inspection	- Resp. movement:- limited - Shape of the chest :- unilateral bulge
Palpation	- Trachea and heart (mediastinal shift) Depends on the amount of fluid - Small amount:- no shift - Moderate amount:- apical shift to the opposite side - Massive amount:- apical and tracheal shift to the opposite side - Tenderness - TVF:- normal

The mediastinum may shift to the same side of effusion in cases of:-

- Malignant effusion due to the underlying **collapse**
- Chronic effusion due to **fibrosis**

Percussion	- basal stony dullness with upper border rising to the axilla (S-line of Ellis)
Auscultation	- Breath sound:- decreased - Additional sound:- $\pm$ pleural rub - V. R. :- aegophony and bronchial breathing over the upper border of effusion due to underlying collapse.

Add to percussion (less important finding):-

Skodiatic resonance:- hyper-resonant above effusion because of compensatory emphysema.

Garland triangle:- relative anterior dullness above the upper border of effusion due to partial collapse.

Greece triangle:- paravertebral triangle of dullness on the opposite side of effusion due to mediastinal shift

Complications:-

- Secondary bacterial infection and empyema formation
- Pleural fibrosis in recurrent cases
- Underlying lung collapse
- Bilateral severe may presented with respiratory distress.

Investigations:-

1- Imaging	2- Fluid ex.	3- For detection of the cause
- X-ray - CT scan - Ultrasound	- Chemical - Bacteriological - Cytological - Thoracoscopy	eg Malignant TB

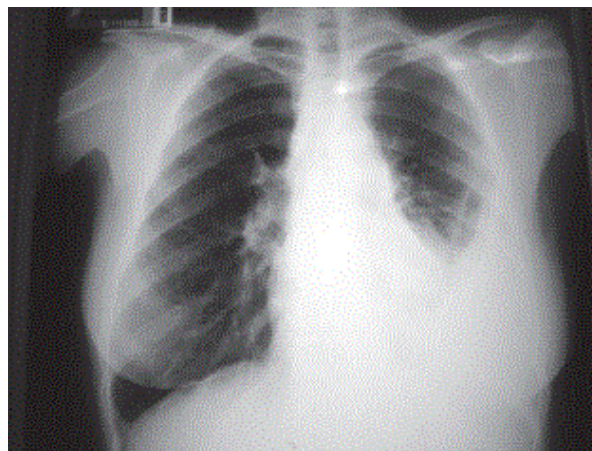
1- Images

Chest X-ray:-

- Free effusion:- homogenous opacity obliterating the costo-phrenic angle with upper border raised to the axilla with mediastinal shift to the opposite side.
- Encysted effusion:- appears as D-shaped opacity
- May detect the cause

Ultrasonography:- specially in caeses of encysted effusion (Can detect up to 200 cc)

CT scan:- mainly for diagnosis of underlying lung lesion



Pleural fluid examination:-

- Chemical:- protein – specific gravity – LDH – Ph - amylase - electrolytes
- Bacteriological:- Gram stain – culture – Zeil Nelssen - PCR
- Cytological:- WBCs count – malignant cell detection

Natures of fluid

	1- Transudate	2- Exudate
Protein	< 3gm %	> 3gm %
Sp. Gravity	< 1016	> 1016
WBCs	< 1000C/mm	> 1000C/mm
LDH	< 200IU/L	> 200IU/L
F/S protein ratio	< 0.5	> 0.5

3- Malignant effusion:-

- Haemoarrhagic - massive - recurrent - contains malignant cells

4- chylous effusion:-

- Milky white - high fat content - cleared with ether – stained orange with SudanIII

5- Empyema:- purulent fluid full of pus cells – Ph < 6.8

In a case of exudate further **microbiological** tests may be needed:-

- Gram stain
- Culture
- ZN for acid fast bacilli

Differential diagnosis :- Other causes of

- Basal lung lesions :- collapse – consolidation – fibrosis
- Sub diaphragmatic :- amebic liver abscess – pyogenic abscess (tidal percussion)
- The cause and nature of fluid.

Treatment**1 - Treatment of the **cause**:-** eg

Treatment of TB:- anti TB drugs - steroid to prevent fibrosis

Treatment of tumors:- cytotoxic - pleurodesis

2 - **Thoracocentesis:-****- benefits:-**

- relief dyspnea
- reduce pleural fibrosis
- reduce intrapleural pressure so improve lymphatic drainage which help in absorbing the reaining amount

- Indication:-

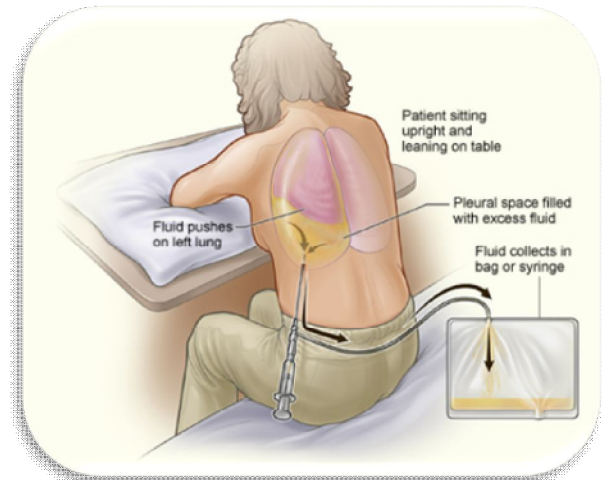
- Severe effusion presented with distress
- Failure of medical treatment
- Complicated as in 2ndry infection

- Precaution:-

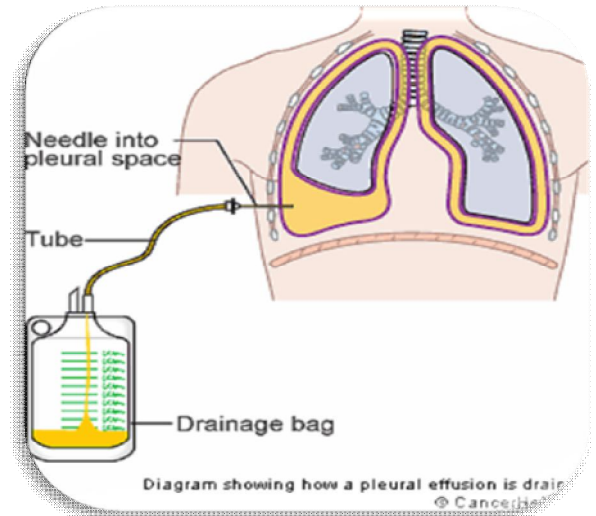
- Should be slowly under complete aseptic conditions.
- About 1000 cc should aspirated each time
- At scapular line under the 10th rib on the upper border of rib below

- Complications:-

- Pleural shock because of pain
- haemothorax – hydropneumothorax - empyema
- acute pulmonary oedema.

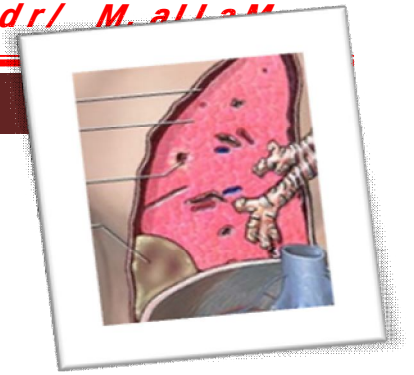
3- **Intercostal tube:-** indicated in case of

- Haemothorax
- Empyema
- Hydropneumothorax
- Chylothorax



3- E m p y e m a

Definition :- inflammation of pleura with purulent fluid formation



Aetiology :-

Secondary:- from the 4 surrounding structures + 1

1- **Lung** :- spread from the lung diseases as pneumonia, TB, Lung abscess, infarction, malignancy

Post-pneumonic empyema:-

- 1- syn-pneumonic empyema:- with bronchopneumonia
- 2- meta- pneumonic empyema:- after pneumonia

2- **Mediastinal** :- spread from the mediastinal diseases as esophageal rupture, mediastinitis or malignancies

3- **Chest wall**:- spread from the chest wall as fracture ribs or osteomyelitis.

4- **Subdiaphragmatic**:- spread from below the diaphragm as amebic or pyogenic liver abscess, subphrenic abscess or pancreatitis

+

5- **Secondry to infection of pleural effusion or haemothorax**: may be as a complication of thoracocentesis

Clinical pictures

Symptoms (++++ FAHM)

- Dry Cough
- Pain
- Dyspnea
- Features of the cause
- **Toxic features as fever, anorexia, headache and malaise**
- Features of the complications

Signs

A) General :-

- Features of the cause
- **Toxic features (F.A.H.M.)**
- Features of the complication

B) Local :-

AS pleural effusion with marked tenderness

Complications:- as usual (page 3) +

- Broncho-pleural fistula (SLS)
- Empyema necessitates:- cystic swelling with impulse on cough
- Chronicity
- Hypo-proteinaemia:- with repeated aspiration

Investigations:-**AS pleural effusion with nature of fluid pus****Treatment:- (4:- as in any infectious disease)****1- General:-**

- Bed rest
- plenty of fluid
- nutrient diet

2- Symptomatic:-

- Analgesic : pain killer
- Antipyretic :- NSAIDs

3- Specific

- Drainage of pus
 - o Closed drainage by repeated aspiration
 - o Interventional drainage by inter costal tube under water seal
 - o Open drainage by open surgery
 - Antibiotic therapy:- it depends on culture and sensitivity
 - o Pencillin for gm +v
 - o Clindamycin and metronidazole for anaerobic
 - o Cloxacillin and vancomycin for staph. Aureus
 - o Aminoglycosides and cephalosporin for gm –v
 - o Anti tuberculous for TB
 - Surgical treatment:- decortication or thoracoplasty
- Indicated in
- o Failure of medical
 - o Complicated cases
 - o Severe cases

4- Treatment of complication**4- C h r o n i c E m p y e m a****Definition :-** empyema for more than 2 months**Aetiology :-** (causes of chronicity or resistance)

Doctor	- Inadequate treatment - Improper antibiotic
Microbe	- Specific organism (eg TB) - Resistant organism (as Anaerobics or MRSA)
Patient	- Presence of underlying disease (cancer) - Presence of foreign body - Development of fistula - Impaired immunity.

Clinical pictures (3A+3F+C)

History of persistent or **fluctuating chest symptoms**:- cough, dyspnea and pain

- **Anorexia** (loss of body weight) - **Anaemia** (fatigue and pallor)
- **Amyloidosis** (renal affection)
- Intermittent fever - **Fistula (SLS)**
- **Fibrosis** as fibro thorax or encysted form
- **Clubbing** of fingers

Local examination:- as in **empyema**

Treatment :- as in **empyema**

+ surgical :-

- o Decortication or pleuro-pneumectomy.

5- P n e u m o t h o r a x

Definition :- air inside the pleural cavity

Types of pneumothorax

According to aetiology:- spontaneous - traumatic

According to outside air communication:- closed - open - tension

Aetiology :- 2X2

1- Spontaneous (non traumatic)

A) Primary :- (benign)

Patient:- young - male - smoker - healthy

C/p:- Spontaneously resolved but recurrent

- May be explained as ruptured bleb or old scar

B) Secondary:-

from the 4 surrounding structures - 1

1- Lung:- with emphysema, TB cavity, Lung abscess or cyst

2- Mediastinal :- as esophageal cancer

3- Subdiaphragmatic:- as subphrenic abscess

2- Traumatic

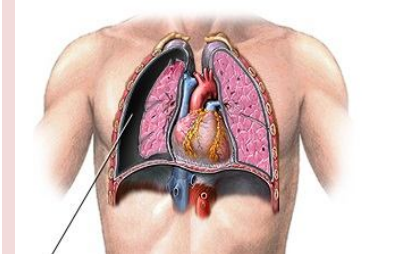
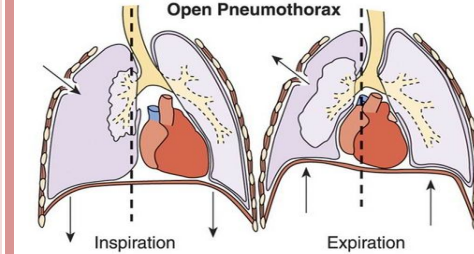
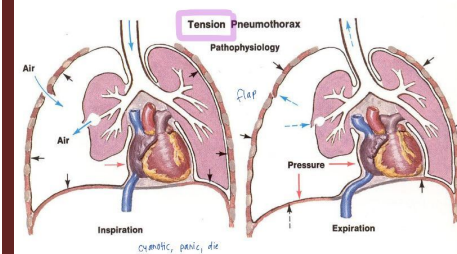
A) Accidental:- not intended -

- operation or penetrating wounds
- thoracocentesis or biopsy
- mechanical ventilator
- bronchoscopy or esophagescopy

B) Artificial :- intended -

- diagnostic after pleurodesis for evaluation of treatment success.
- therapeutic as collapse therapy (obsolete)

Types According to outside air communication:- closed - open - tension

Closed	Open	Tension
no communication with the atmospheric air	free communication with the atmospheric air (like fistula)	valve-like tear allowing air to enter the pleural sac and preventing its escape
Subside with time	usually stationary	progressive and fatal
		

Clinical pictures**Symptoms**

- **pain** :- acute tearing pain increased with inspiration
- **Acute dyspnea** *Features of the cause:- eg TB*
- **in Tension or bilateral pneumothorax:-**

Acute severe dyspnea, cyanosis, right sided heart failure and shock with progressive deterioration of the respiratory function

Signs**A) General :-**

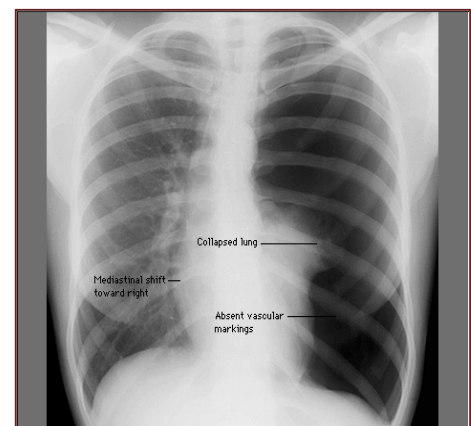
- Features of the cause
- Features of the complication
- Respiratory distress in **Tension or bilateral pneumothorax**

B) Local :-

Inspection	- Resp. movement:- limited - Shape of the chest :- unilateral bulge in tension pneumothorax
Palpation	- Mediastinum:- shift to the opposite side in tension pneumothorax - TVF:- normal or reduced
Percussion	- hyper-resonant or tympanic resonant in tension pneumothorax - down ward displacement of hepatic dullness in right sided affection
Auscultation	- Breath sound :- decreased up to No air entry - Amphoric breath :- in open or tension pneumothorax - Positive coin test - Pneumothorax click in left side affection.

Investigations:-**A- X-ray chest:-**

- homogenous jet black with no lung markings
- collapsed underlying lung
- depressed flat diaphragm
- wide horizontal ribs
- mediastinal shift to the opposite side

**B- Intra pleural manometer:-** help in differentiating the type :-

- **Closed** :- the pressure is higher than normal but still **lower** than atmospheric air
- **Open** :- the pressure is equal to atmospheric air (oscillate around **zero**)
- **Tension** :- the pressure is higher than the atmospheric air (**positive**)

Differential diagnosis

- causes of acute chest pain
- causes of acute dyspnea
- causes of hyper-inflated lung as emphysema

Tension pneumothorax should be differentiated from causes of acute chest pain, dyspnea, cyanosis, acute right sided heart failure and shock:-

- massive myocardial infarction
- massive pulmonary embolism
- massive lung collapse

Treatment:- according to the clinical presentation and type

1- Treatment of tension pneumothorax (medical emergency)

- immediate **decompression** by inserting wide bore needle through the intercostal space (in 2nd intercostal space) then intercostal tube under water seal if possible
- **Analgesics** :- as pethidine 50-100 mg
- **Oxygen** therapy
- Closure of the **wound** if external
- treatment of complications as heart failure

2- Spontaneous pneumothorax (mild):-

- **Conservative** treatment as bed rest and analgesics

3- Under water seal (intercostal tube insertion)

- indicated:-**
- marked or tension pneumothorax
 - patient on ventilator
 - bilateral pneumothorax -

4- Treatment of the cause

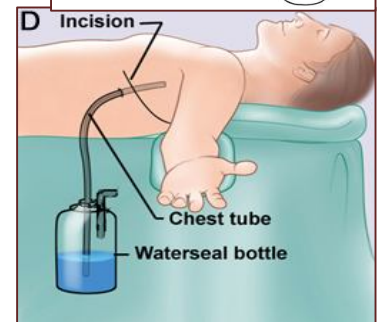
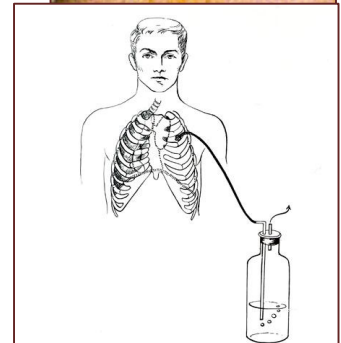
5- Surgical treatment:-

partial pleurectomy with closure of the tear

- indicated:-**
- failed medical treatment
 - recurrent pneumothorax

4- Pleurodesis :- injection of chemical material inside the pleural sac to induce sterile pleurisy followed by adhesion (fibrosis)

- indicated:-**
- in resistant cases



Differentiation between closed, open & tension pneumothorax:-

	Closed	Open	Tension
Dyspnea	Mild	Mild	Marked
Cyanosis	Absent	Absent	Present
Shock	Absent	Absent	Present
Acute RVF	Absent	Absent	Present
Mediastinal shift	Absent	Absent	Present
Amphoric B	Absent	Present	Present
Intrapleural pressure	-ve	Zero	+ve

Differentiation between primary & secondary pneumothorax

	Primary	Secondary
Past history	-Ve	+Ve
Dyspnea	-Ve	+Ve
Features of cause	-Ve	+Ve
Course	Spontaneous recovery	Requiring treatment

6- H y d r o - P n e u m o t h o r a x

Definition :- air and fluid inside the pleural cavity, the fluid may be pus (**pyo-pneumothorax**) - blood (**haemo-pneumothorax**)

Aetiology :-**1- post effusion:-**

- during aspiration of fluid
- empyema opening to bronchus

2- post pneumothorax

- during aspiration of air (usually haemorrhagic)

3- miscellaneous

- rupture of lung abscess or TB cavity
- infection with gas forming organism
- rupture sub-phrenic abscess.

Clinical picture:-**Symptoms**

- pain - dyspnea - cough
- Features of the cause:- eg TB
- **broncho-pleural fistula:-** features of SLS

Signs**A) General :-**

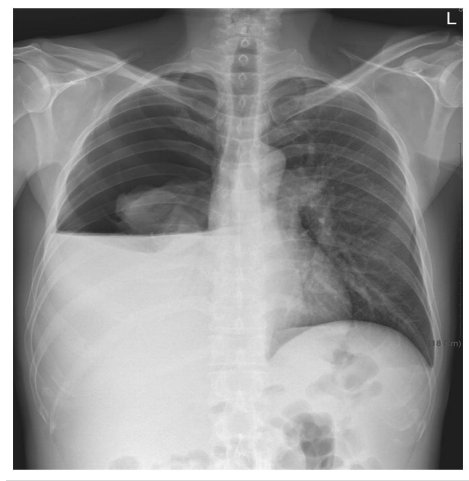
- Features of the cause - Features of the complication
- Respiratory distress in **severe form**

B) Local :-

Inspection	- Resp. movement:- limited - Shape of the chest :- unilateral bulge
Palpation	- Mediastinum:- shift to the opposite side - TVF:- reduced
Percussion	- Basal stony dullness with horizontal upper border - Tympanic resonant above - Shifting dullness is characteristic
Auscultation	- Breath sound :- decreased up to No air entry - Amphoric breath :- in broncho-pleural fistula - Succussion splash.

Investigations:-**A- X-ray chest:-**

- homogenous opacity obliterates the costo-phrenic angle with upper border horizontal
- jet black translucency above
- collapsed underlying lung
- mediastinal shift to the opposite side

B- Diagnostic aspiration:- as in Pl. effusion**C- Methylene blue test:- for fistula****Treatment:-**

- 1- Under water seal (intercostal tube insertion) drainage:-
- 2- Treatment of the cause

P n e u m o n i a

Definition :- inflammation of the distal lung (terminal bronchioles, alveolar spaces and interstetium)

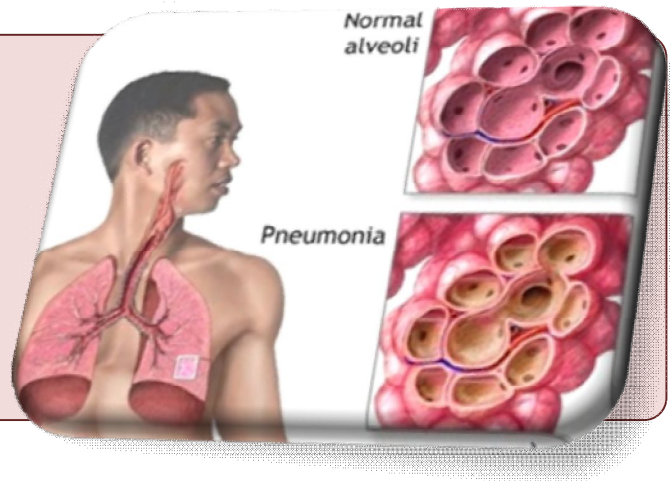
Classifications of pneumonia

Aetiological classification:-

- A- infective
- B- Non-infective

Anatomical classification:-

- Lobar pneumonia
- Bronchopneumonia (Lobulr pneumonia)
- Segmetar and sub-segmental pneumonia



Aetiology :-

A) Infective :- (according to causative organism)

- Viral:- e.g. varicella
- Bacterial
 - Gram +v cocci:- St. pneumoniae - Staph aureus
 - Gram -v bacilli:- H. influenzae - klebsiella - legioneilla
 - Anaerobic
- Mycobacterium tuberculosis
- Chlamydia
- Rickettsia
- Mycoplasma
- Protozoa :- Pneumocystis carinii
- Helminthes :- Filariasis

B) Non-infective :-

- Physical:- radiation pneumonitis
- Chemical:- lipid pneumonia
- Collagen:- as in SLE
- Allergic:- Loffler's pneumonia

Pathological stages of Lobar pneumonia

- 1- **Congestion:-** hypaeremia with increases blood stagnation around the alveoli with air space reduction
 - 2- **Red hepatization:-** inflammatory haemorrhagic exudate collected inside the alveoli and coagulated
 - 3- **Gray hepatization:-** the RBCs in the exudate reduced and the colour changed to yellowish and gray
 - 4- **Resolution:-** liquefaction of exudate to be excreted and absorbed by blood and lymphatics
- + pleurisy in the overlying pleura

Risk factors

Lobar pneumonia	Bronchopneumonia
- After viral infection - cold weather - overcrowdings - malnutrition - hyposplenism	- extreme of age - immuno deficiency - hospitalized - underlying chest disease

Clinical pictures (of both lobar and bronchopneumonia)**- Onset - course - duration**

Lobar pneumonia	Bronchopneumonia
Acute onset, acute offset (abrupt) and short duration (1-2weeks)	Insidious onset, gradual offset (lysis) and longer duration (> 2weeks)

- Symptoms

Toxic features	As fever, anorexia, headache and malaise Somnolence and confusion (elder) convulsions (child)
Cough	Analysis of cough reflecting the stage of pneumonia:- - Early :- dry cough - Hepatization :- rusty cough - Resolution :- profuse and watery
Others	- Pleuritic stitching pain - Dyspnea - Features of the complications

- Signs**A) General :- Toxic features**

High Fever up to 39-40
Marked tachypnea with shallow breathing
Pallor and toxic facies
Cental cyanosis in severe cases
Jaundice
Meningism and convulsion (mainly in children)

B) Local :-**Signs of consolidation**

- **localized in lobar pneumonia**
- **bilateral and patchy in bronchopneumonia**

Local signs of consolidation

Inspection - Resp. movement:- limited
- Shape of the chest :- Normal

Palpation - Mediastinum:- Central
- TVF:- **Increased**
- May be Palpable pleural rub

Percussion - **Lobar dullness with tenderness**

Auscultation - Breath sound:- **bronchial breathing**
- Add. sound:- **Crepitations**
(as regard the stage of the disease)

Early stage	Hepatization	Resolution stage
Fine crepitations (indux)	Medium sized consonating	Coarse crepitations (redux)

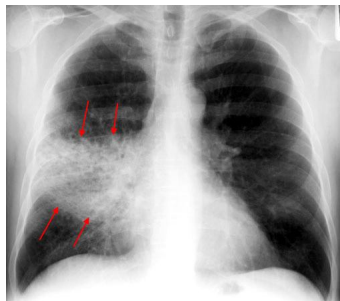
- Additional sound :- **pleural rub**
- V. R. :- **increased**

Complications:- **as usual (page 3) +**

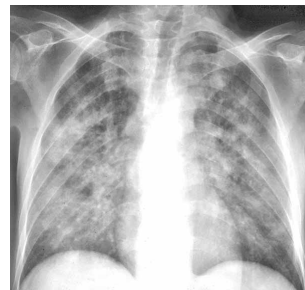
- **Unresolving pneumonia:-** persistent for longer than 2 weeks
 - *impaired immunity*
 - *undetected underlying lung diseases as cancer*
 - *inadequate treatment*
 - *specific organism as TB*
- Recurrent pneumonia
- in severe cases :- DIC - SIADH
- in severe bronchopneumonia :- respiratory failure

Investigations:-1- Chest X-ray:-

Lobar pneumonia:- homogenous opacity occupying one lobe



Bronchopneumonia:- bilateral patches of opacities



- Features of complication :- as L abscess

2- Sputum analysis:- for bacteriological analysis and may be culture and sensitivity
 - St. pneumoniae appears as Gm positive diplococci

3- CBC:- polymorph nuclear leucocytosis

4- Blood culture:- in only 30% of cases

5- Aspiration of pleural fluid:- if present

6- Serological tests:- in some specific organisms

Treatment:-

(4:- as in any infectious disease)

CURB - 65 criteria		
Confusion	1	<u>Patient scored as:-</u> 0-1 = Treat as outpatient 2-3 = Short stay 4-5 = Should be hospitalized
Uraemia > 20 mg %	1	
Respiratory rate > 30	1	
Blood pressure < 90/60	1	
Age > 65	1	

1- General:-

- Bed rest
- plenty of fluid
- nutrient diet

2- Symptomatic:-

- Analgesic : pain killer
- Antipyretic :- NSAIDs
- Mucolytic and expectorant :- bromhexine
- oxygen therapy in severe cases

3- Specific Antibiotic therapy:- Antibiotic selection

A- The usual regimen is -

- Crystalline penicillin G :- 1 million unit / 6 hrs IV for 7 days
- Erythromycin 500 mg/6 hrs (for penicillin allergic)

if no response or severe case :- 3rd generation cephalosporine - piperacillin - or aminoglycoside can be used

B- Severity dependant regimen:-

Mild (outpatient)	Moderate	Severe
Amoxycillin or Doxacyclin or Macrolids	- Benzyl-Penicillin IV + doxacyclin or Macrolids or - Ceftriaxone + Gentamycin	- Benzyl-Penicillin iv + azithromycin + Gentamycin or Ceftriaxone or imipenem

C- After culture and sensitivity

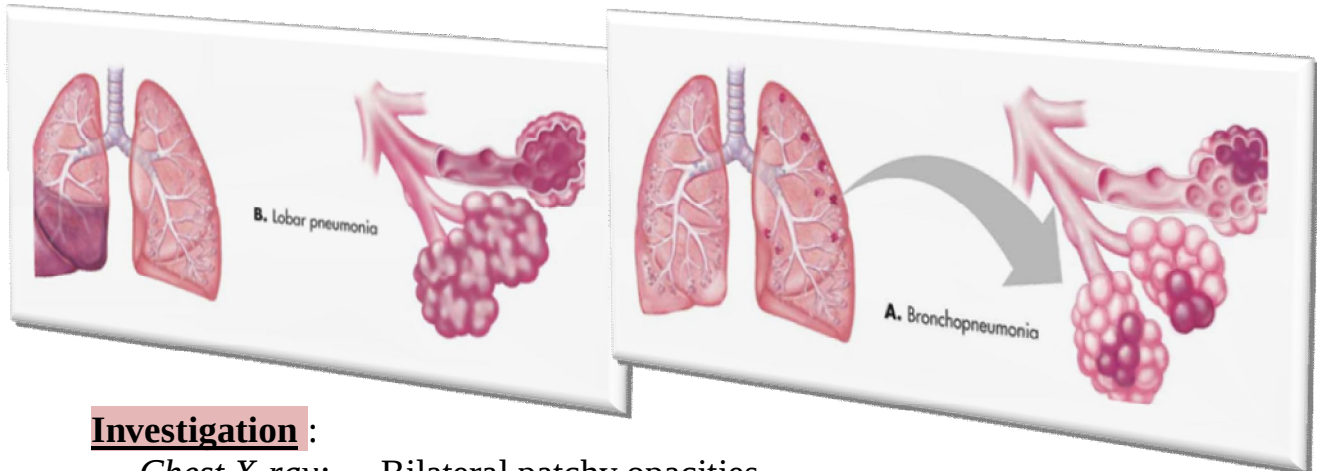
- o Penicillin for gm +v
- o Clindamycin and metronidazole for anaerobic
- o Cloxacillin and vancomycin for staph. Aureus
- o Aminoglycosides and cephalosporin for gm -v
- o Anti tuberculous for TB

4- Treatment of complication

B R O N C H O P N E U M O N I A

Clinical pictures:- as lobar pneumonia except:-

- risk factors - onset, course and duration
- Local signs as L. pneumonia (but **bilateral and patchy**)



Investigation :

Chest X-ray:- Bilateral patchy opacities
May show complications e.g. abscess.

Sputum examination:- Examination with Gram stain.
Culture & sensitivity test should be done

Complications:- as L. pneumonia + may be respiratory failure

Treatment:

Similar to treatment of lobar pneumonia (See before)
Selection of antibiotics depends on the causative organism.

Infective pneumonia:-

- 1- **Community-acquired pneumonia:-** The commonest form
- 2- **Pneumonia in immunocompromised host:-** as in AIDS
- 3- **Nosocomial pneumonia:-** hospital acquired
 - 2-3 days after hospital admission
 - Caused by:- pneumococci - staph - Gm-ve bacilli
 - Treated with:- 3rd generation cephaosporin - ciprofloxacin - b-lactam

Primary atypical pneumonia:-

Caused by organism without cell wall so needs specific bacteriological tests and specific antimicrobial drugs as :- mycoplasm - chlamydia - viral - legionella.

Special types of pneumonia (usually presented as bronchopneumonia)

Viral pneumonia:- -common in children

- Causes:- influenza, varicella, measles or resp. syncytial viruse
- C/P :- Flu-like manifestation, dry cough, dyspnea and few signs
- investigation :- diffuse infiltration in x-ray + viral serology
- ttt :- supportive.

Mycoplasma:- -common in young adults

- C/P : A- Pulmonary manifestation :- dry cough, dyspnea and mucoid or bloody sputum - **scanty signs** as few crepitation
- B- Extra-pulmonary manifestation :- toxic features - erythema nodosum - neuropathy - meningitis - encephalitis - cold agglutinin haemolytic anaemia
- investigation :- diffuse infiltration in x-ray + extra-pulmonary
- ttt :- tetracyclin - ciprofloxacin - erythromycin

Staph :- -common as nosocomial

- C/P :- may be severe and fatal - tend to abscesses formation
- ttt :- cloxacillin - vancomycin

Friedlander:- apical pneumonia

- Causes:- Klebsella
- C/P :- apical pneumonia with cavity formation
- investigation :- apical lesion in x-ray
- ttt :- aminoglycosides - cephalosporin

Legionnaire's:- - common with air conditions

- Causes:- legionella (gram -ve coccobacillus) - prefer very cold situation
- C/P :- Flu-like manifestation, dry cough, then productive
- gastro intestinal manifestation
- investigation :- lobar or patchy in x-ray + hyponatraemia + Gimenez stain
- ttt :- azithromycin - rifampicine - erythromycin.

Pneumocystis carinii:- -common in AIDS

- Causes:- protozoal
- C/P :- dry cough, dyspnea and few signs
- investigation :- diffuse infiltration in x-ray + silver nitrate stain
- ttt :- co-trimexazol

S u p p u r a t i v e L u n g S y n d r o m e (S L S)

Definition :- Group of diseases characterized by cough and expectoration of Big, Purulent, Postural and foeted sputum)

These diseases are :

- Lung abscess
- Bronchiactasis
- Infected lung cyst
- Empyema with bronchopleural fistula

1- L U N G A B S C E S S

Definition:- Localized area of pyogenic organism infection characterized by tissue necrosis and suppuration then cavity formation

Aetiology:

I- Primary lung abscess (Inhalation) : (common)

- Inhalation of septic material: e.g. upper respiratory secretions, vomitus or foreign body.
- Absence of respiratory defense mechanisms e.g. cough reflex: as patient under anaesthesia, coma or convulsions.

Causative organisms include : - Anaerobes e.g. Bacteroides

- Gm-positive cocci e.g. Staph aureus
- Gm-negative bacilli e.g. Klebsiella

II- Secondary lung abscess: from the 4 surrounding structures + 1

- 1- **Lung** :- spread from the lung diseases as pneumonia (*especially staphylococcal & Friedlander's pneumonias*), TB and infarction, malignancy
- 2- **Mediastinal** :- spread from the mediastinal diseases as pericarditis, mediastinitis or malignancies
- 3- **Chest wall**:- spread from the chest wall as fracture ribs or osteomyelitis.
- 4- **Subdiaphragmatic**:- spread from behind the diaphragm as amebic or pyogenic liver abscess, subphrenic abscess or pancreatitis
- +
- 5- **Pyaemia : (Pyaemic abscesses)**:- May occur due to e.g. infective endocarditis, septic thrombophlebitis, osteomyelitis (septic focus). caused by Staph Aureus.

Pathology:**A- Pathology of inhalation abscess:**

- Site: it is usually solitary, occurring more commonly in the right lower lobe (the right bronchus is wider and more in direct continuity with the trachea).
- Passes through 3 stages:

1- Pneumonic stage:

Area of consolidation & the covering pleura may show acute pleurisy.

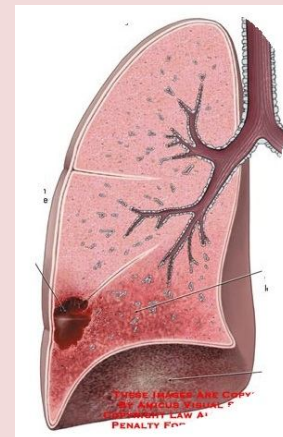
2- Stage of acute abscess:

Tissue necrosis and suppuration occur in the consolidated area.
Rupture into the draining bronchus leaving a cavity.

characterized by irregular necrotic wall & surrounded by consolidated area.

3- Stage of chronic abscess:

The abscess wall becomes thickened by fibrous tissue.
The covering pleura may show thickening & fibrous adhesions

**B- Pathology of pyaemic abscesses:**

They are usually bilateral, multiple, small & of equal size.

C- Pathology of secondary abscesses:

Related to the site of primary lesion:- e.g. abscess on top of cancer.

Clinical pictures:-**3 stages**

Pneumonic = pneumonia

Acute abscess

Chronic abscess = ch. empyema

1- Pneumonic stage:- (as in pneumonia)**Symptoms**

- Toxic features as fever, anorexia, headache and malaise
- Features of the complications
- Pleuritic stitching pain
- **cough:-** firstly dry then rusty (not postural)
- dyspnea

Signs**A) General :-**

- Toxic features
 - High Fever
 - Marked tachypnea with shallow breathing
 - Pallor and toxic facies

B) Local :- Signs of consolidation (localized)**Local signs of consolidation**

Inspection - Resp. movement:- limited
 - Shape of the chest :- Normal

Palpation - Mediastinum:- Central
 - TVF:- **Increased**
 - May be Palpable pleural rub

Percussion - Lobar dullness with tenderness

Auscultation - Breath sound:- **bronchial breathing**
 - Add. sound:- **Crepitations**
 (as regard the stage of the disease)

Early stage	Hepatisation	Resolution stage
Fine crepitations (indux)	Medium sized consonating	Coarse crepitations (redux)

- Additional sound :- **pleural rub**
 - V. R. :- **increased**

2- Acute abscess stage:-**Symptoms**

- Improvement of the general condition & drop of Temperature.
- Paroxysmal cough related to posture with expectoration of excessive purulent foited sputum when the patient lies on the healthy side. (SLS)
- Haemoptysis may occur.

Signs A) General :- Less toxic features

B) Local :- Signs of cavity + Pleural rub**Local signs of cavity**

Inspection - Resp. movement:- limited
 - Shape of the chest :- Normal. Rarely retraction if healed by **Fibrosis (with chronicity)**

Palpation - Mediastinum:- Central (Rarely shift with **fibrosis**.)
 - TVF:- **Increased** (only if the cavity is **superficial &** surrounded by consolidation)

Percussion - Lobar dullness with tenderness

Auscultation - Breath sound:- **bronchial breathing** (cavernous or amphoric)
 - Add. sound:- **Crepitations** (medium-sized or coarse, consonating or non-consonating)
 - Additional sound :- **pleural rub**
 - V. R. :- **increased**
 - Post-tussive suction may be heard over a collapsible cavity

3- Chronic abscess stage:- (as in empyema)

Symptoms

- Progressive deterioration of general condition & loss of weight.
- Symptoms of (SLS) Attacks of retention syndrome.

Signs

A) General :- (as any chronic suppuration)

- Anorexia (loss of body weight) - Anaemia (fatigue and pallor)
- Amyloidosis (renal affection)
- Intermittent fever - Fistula (SLS)
- Fibrosis as fibro thorax or encysted form
- Clubbing of fingers

B) Local :- Signs of cavity $\pm$ fibrosis

- Features of a cavity.

Signs of a CAVITY are variable depending on :

- ♦ Site: **superficial** or deep.
- ♦ Size: small or **large**
- ♦ Surroundings: **consolidation** or fibrosis
- ♦ Draining bronchus : patent or occluded
- ♦ Contents: full or empty.

Complications :- as usual (page 3)

Investigation:-

1- Chest X-ray :-

- Cavity with fluid level
- Features of the causes or complication

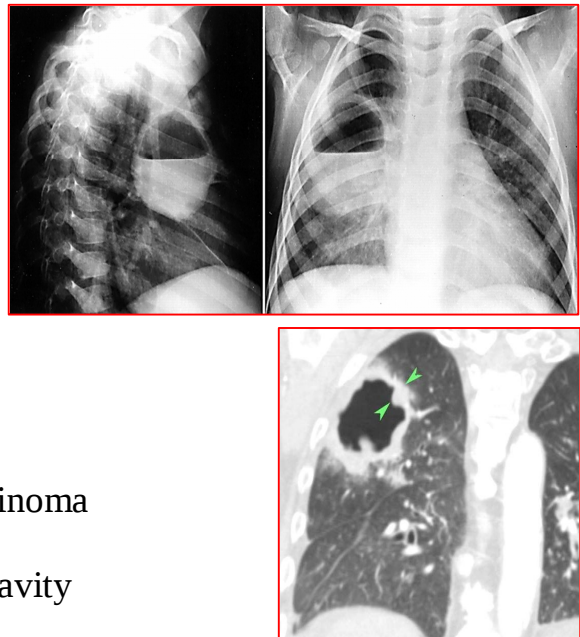
2- Sputum :- culture & sensitivity

3- Chest CT scan :- diagnostic

4- Bronchoscopy:

- Localize the site of the abscess.
- Exclude the presence of bronchial carcinoma
- Detect & remove foreign body
- Drain pus & inject antibiotics into the cavity

5- Broncography: indicated mainly to exclude bronchiectasis.



Differential diagnosis:

- A. Causes of suppurative syndrome (SLS)
- B. Tuberculous cavity
- C. Cavitory carcinoma

Treatment:- (4:- as in any infectious disease) + Pus drainage + Surgical**1- General:-**

- Bed rest
- plenty of fluid
- nutrient diet

2- Symptomatic:-

- Analgesic : pain killer
- Antipyretic :- NSAIDs
- Mucolytic and expectorant :- bromhexine
- oxygen therapy in severe cases

3- Specific (drainage + antibiotic therapy)**A- Drainage of pus:-**

1. Postural drainage:- 2-3 times daily – the patient usually lies on the healthy side - It may be helped by percussion – associated with respiratory exercises.
2. Bronchoscopic aspiration :- with injection of antibiotics is rarely used.
3. External drainage : is rarely used.

B- Antibiotic therapy:-

- Crystalline pencillin G :- 1 million unit / 6 hrs IV for 7 days
- Erythromycine 500 mg/6 hrs (for penecillin allergic)
- if no response or severe case :-3rd generation cephalosporine - piperacillin - or aminoglycoside can be used
- After culture and sensitivity
 - o Pencillin for gm +v
 - o Clindamycin and metronidazole for anaerobic
 - o Cloxacillin and vancomycin for staph. Aureus
 - o Aminoglycosides and cephalosporin for gm –v
 - o Anti tuberculous for TB

4- Treatment of complication**Surgical treatment:**

Segmentectomy or lobectomy may be undicated in:-

1. Failure of medical treatment.
2. Complicated :- Severe recurrent haemoptysis, empyema or pyopneumothorax.
3. Association:- Surrounding bronchiectasis or suspension of malignancies

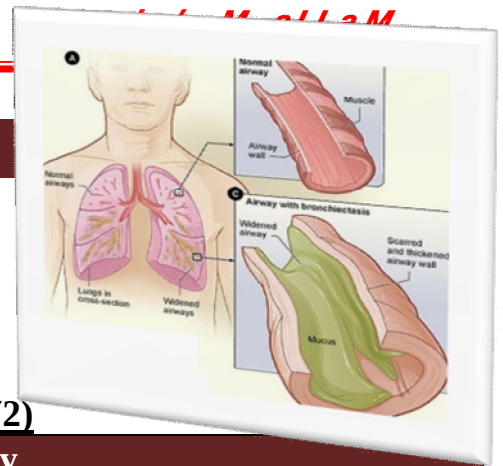
2- Bronchiectasis

Definition:- Abnormal permanent dilatation of the bronchi and bronchioles with suppuration

Types and aetiology (2X2)

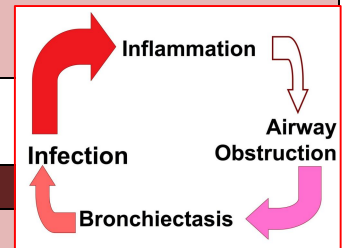
Congenital bronchiectasis (2)

Primary	Secondary
Isolated bronchiectasis	A. <u>Immotile cilia syndrome</u> - Bronchiectasis. - Sinusitis & otitis media. - Male sterility - May be dextrocardia or situs inversus totalis (Kartagener's syndrome). B. <u>Cystic fibrosis</u> C. <u>Immunodeficiency syndromes</u>



1. Acquired bronchiectasis (2):

<u>Bronchial obstruction</u>	Secondary
1- <u>Partial</u> : valve-like mechanism	<u>Infection and Fibrosis :</u> - Bronchopneumonia - Measles - Lung abscess especially during childhood - Whooping cough - TB
2 - <u>Complete</u> :	<u>Mechanism</u> 1- Destruction of the bronchial muscles & elastic fibers resulting in bronchial dilatation 2- Peribronchial fibrosis causes traction over the bronchi leading to further dilatation



Pathology:

Site:- bilateral & basal

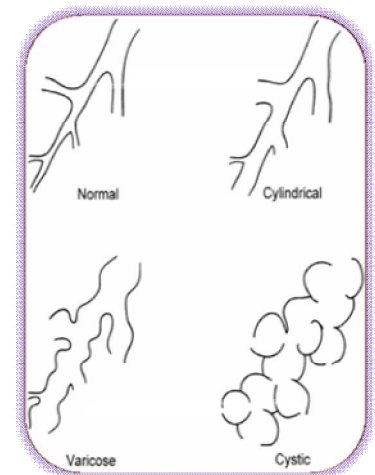
- But may be apical in TB

- Localized in foreign body or tumour.

Shape:- may be cylindrical, tubular, fusiform or serpentine

Changes:- bronchi are dilated with desquamation & ulceration of the mucous membrane

Others:- The surrounding lung tissue may show consolidation, Emphysema of the upper parts of the lungs.



Clinical picture**Symptoms: (4Ss) + haemoptysis****- Suppurative syndrome:**

- Paroxysmal cough related to posture with expectoration of excessive purulent foeted sputum.
- More common in the morning and on **stooping** foreword or lying down.
- Of insidious onset progressive course over years with winter exacerbations.

- SOB (Dyspnea) ± Chest pain**- Symptoms of complications****- Sinusitis :** is a common association

+ **Haemoptysis:** Usually blood-tinged sputum but frank haemoptysis may occur (**bronchiectasis sicca haemorrhagica**) secondary to TB.

Signs**A) General :- (as any chronic suppuration) A-F-C**

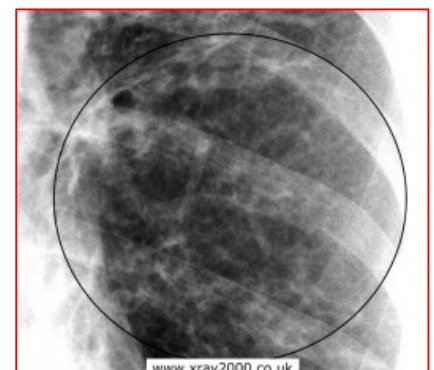
- Anorexia (loss of body weight) - Anaemia (fatigue and pallor)
- Amyloidosis (renal affection)
- Intermittent fever - Fistula (SLS)
- Fibrosis as fibro thorax or encysted form
- Clubbing of fingers
- + - **LL oedema**

B) Local :- Signs of Bronchiectasis are usually bilateral & basal (BB)

Inspection	- Resp. movement:- limited - Shape:- Normal except after fibrosis may be retracted
Palpation	- Mediastinum:- Central - TVF:- Increased Bilateral basal
Percussion	- Patchy dullness bilateral basal with tenderness
Auscultation	- Breath sound:- bronchial breathing bilateral and basal - Add. sound:- Crepitations bilateral and basal (medium-sized or coarse, consonating or non-consonating) - V. R. :- increased bilateral and basal

Investigation:-**1- Chest X-ray :-**

- Ring shadows as **honey-comb** appearance bilateral basal.
- Parallel lines as **tram-lines** appearance.
- May show hypertranslucency in upper parts due to emphysema.



3- **Chest CT scan** :- diagnostic if high resolution Ct-scan (HRCT-scan)

2- **Sputum** :- culture & sensitivity

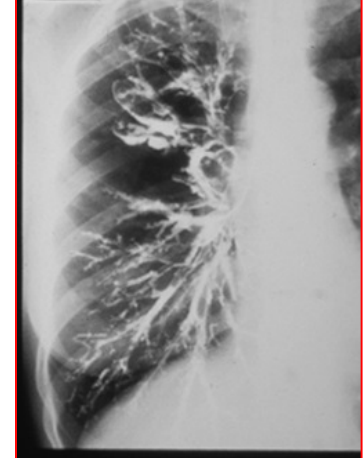
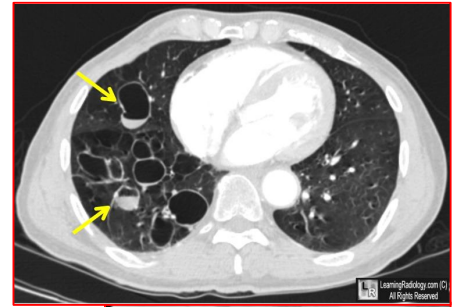
- The most commonly isolated organisms are **H. influenza & St. pneumonia**

4- **Bronchoscopy**:

- May reveal the underlying cause.
- May be used for drainage of pus & injection of antibiotics.

5- **Bronchography**:

- It was the investigation of choice to confirm the diagnosis and to localize the site, extent of bronchiectasis before surgery.
- Bronchiectasis appears as **cylindrical, saccular, fusiform or varicose** dilatation of the bronchi.



6- **Investigations for diagnosis of the cause**: e.g. tests for cystic fibrosis

Differential diagnosis:

- Causes of suppurative syndrome (SLS)
- Causes of haemoptysis as Tuberculous

Treatment:- as Lung abscess

(4:- as in any infectious disease) + Pus drainage + Surgical

1- **General:-**

- Bed rest
- plenty of fluid
- nutrient diet

2- **Symptomatic:-**

- Analgesic : pain killer
- Antipyretic :- NSAIDs
- Mucolytic and expectorant :- bromhexine
- Oxygen therapy in severe cases

3- **Specific (drainage + antibiotic therapy)**

A- **Drainage of pus:-**

1- Postural drainage:- 2-3 times daily – the patient usually lies pron - It may be helped by percussion – associated with respiratory exercises.

2- Bronchoscopic aspiration :- with injection of antibiotics is rarely used.

B- Antibiotic therapy:-

- Crystalline pencillin G :- 1 million unit / 6 hrs IV for 7 days
- Erythromycine 500 mg/6 hrs (for penecillin allergic)
- *if no response or severe case :-* 3rd generation cephalosporine - piperacillin - or aminoglycoside can be used
- After culture and sensitivity
 - o Pencillin for gm +v
 - o Clindamycin and metronidazole for anaerobic
 - o Cloxacillin and vancomycin for staph. Aureus
 - o Aminoglycosides and cephalosporin for gm -v
 - o Anti tuberculous for TB

4- Treatment of complication**Surgical treatment** indicated in:-

1. Failure of medical treatment.
2. Complicated:- Severe recurrent haemoptysis, empyema or pyopneumothorax.
3. Association:- Surrounding abscesses or suspension of malignancies

Cystic fibrosis

Definition:- also known as mucoviscidosis, is an autosomal recessive disorder characterized by thick, viscous secretions (abnormal transport of chloride and sodium)

Clinical picture

- As bronchiectasis
- Intestinal - biliary - pancreatic illness
- Sinusitis

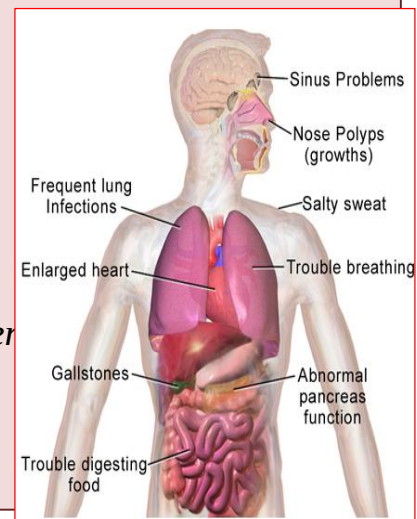
Investigations: as bronchiactasis

+ Sweat test:-

- Sweating is induced by pilocarpine
- Then sodium and chloride concentrations assessment
- Elevated concentration is diagnostic

Treatment: as bronchiactasis

N.B.: absent vas deferens is a common association .



3- I n f e c t e d l u n g c y s t

Definition:- congenital bronchial cystic formation usually complicated with infection

Aetiology and types:- 2 forms

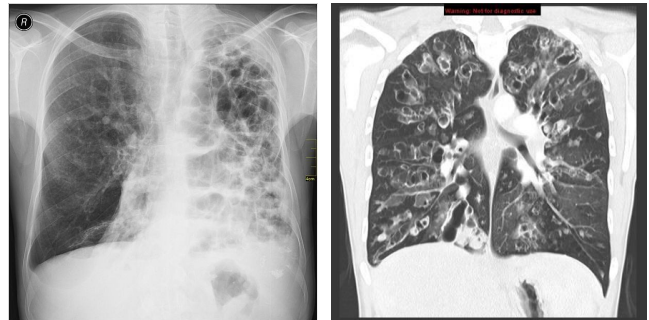
Central	Peripheral
- Solitary - not connected to bronchial tree or alveoli	- Multiple - Connected to bronchial tree and/or alveoli - usually infected (SLS)

Clinical picture :- as bronchiectasis

Complications :- as usual (page 3)

Investigation :- as bronchiectasis
+ **X-ray:-** Soap-bubble

Treatment:- as bronchiectasis



4- E m p y e m a w i t h b r o n c h o - p l e u r a l f i s t u l a

Definition:- Empyema complicated with fistula formation connecting the bronchioles with the retained pus inside the pleura

Aetiology:- as Empyema

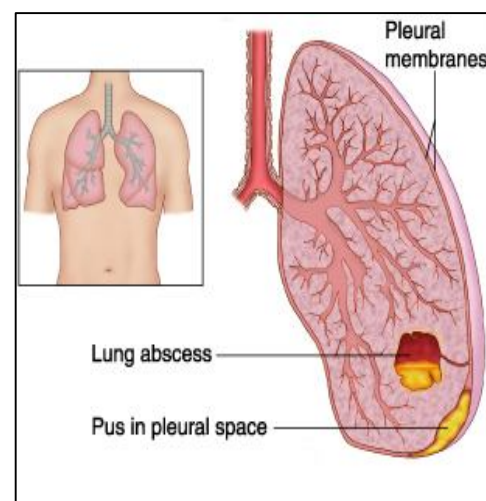
Clinical picture :- as Empyema + SLS

Complications :- as usual (page 3)

Investigation :- as Empyema
+ **diagnostic test:-**

- Methylen blue test
- Radio-isotopic study

Treatment:- as Empyema
+ **surgical closure of fistula**

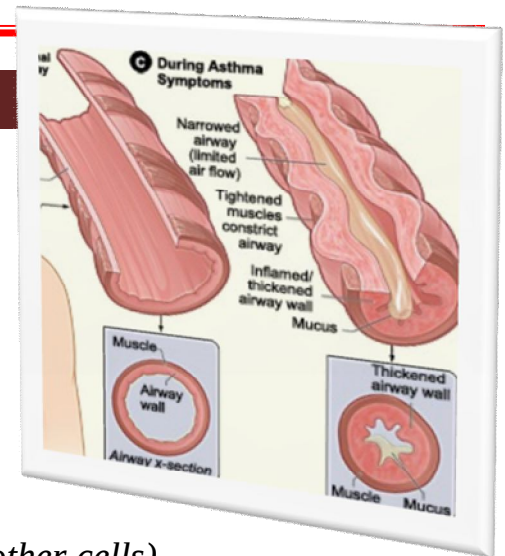


B r o n c h i a l A s t h m a

Definition:- condition of airway hyper-responsiveness with reversible airflow obstruction that results in intermittent symptoms of wheezing, dyspnea and cough. Affecting 5% of the population. Men and women are equally affected.

Pathophysiology:

- 1) Smooth muscle spasms (**Bronchospasm**).
- 2) Inflammatory **exudates** in submucosa (*eosinophils & other cells*).
- 3) **Mucus plugging** of the bronchioles.
- 4) **Oedema** of bronchial mucosa.



There are two forms of bronchial asthma as regard genesis:

Allergic asthma (extrinsic asthma)	Non-allergic (intrinsic asthma)
- Children & young adults - Positive Family history - History of other allergy	- Older adults
- Intermittent - with known triggering factor	- Continuous - unknown triggering factor
<u>Common allergens include:-</u> 1. House dust mites (in pillows, mattresses, furniture, carpets, and drapes). 2. Cockroaches, cats, and seasonal pollens. 3. Other antigens:- - Injection (e.g. penicillin, serum) - Ingestion (e.g. fish, eggs) - Contact (e.g. feather, wool)	<u>Triggering factors (non-allergen)</u> -Broncho-pulmonary Aspergillosis -Aspirin-sensitive asthma -Atmospheric pollution e.g. ozone -Changes in the weather -Drugs e.g. NSAIDs & B-blockers -Emotional stress - GERD -Exercise – induced asthma -Exposure to cigarette smoke & dust -Exposure to cold: -Hyperventilation -Occupational asthma -Respiratory tract infections (viruses)
Skin test:-	Positive
IgE:-	Hight in 60%
	Negative
	10%

Patients commonly show features of both types of asthma.

Aspirin-sensitive asthma :- triad of Bronchospasm, nasal polyps & aspirin sensitivity

A- Extrinsic or atopic asthma:-

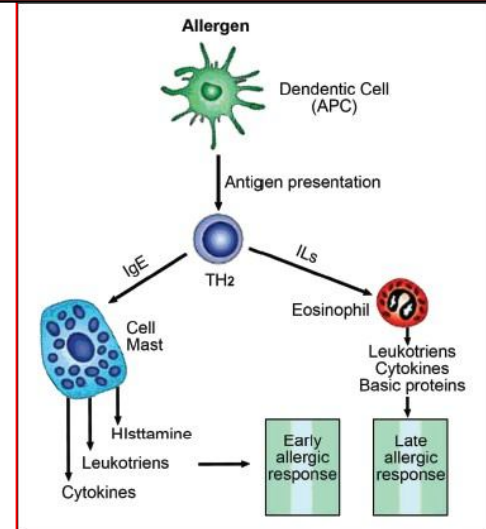
Atopy:- Localized type 1 hypersensitivity.
(Well-defined sensitivity to specific allergens)

A. Early Asthmatic Response:

- ♦ After the first exposure, specific **IgE antibodies** are formed and bind to receptors on the **mast cells** of the bronchial tree.
- ♦ In the next exposure **Ag-Ab binding** resulting in degranulation of the mast cell which releases mediators (**histamine**, bradykinin, leukotrienes, prostaglandins)
- ♦ This begins within 10 ms., peaks in 30 ms., and resolves in 3 hs.

B. Late Asthmatic Response:

Mediated by an influx of neutrophils, eosinophils, and mononuclear cells.

**B- Intrinsic (non-allergic):-**

Probably these patients have highly sensitive vagal receptors

- Started by reflex secretion of **acetylcholine** (at vagal nerve endings).
- Causes **histamine** release from the mast cells.
- Results in immediate **bronchospasm** with overproduction of **mucus**.

Clinical picture:-**Symptoms:-**

- The onset of attacks usually in early morning (**high vagal tone**)
- Triad of **wheeze**, non productive **cough & dyspnea**
- Associated:- anxiety, chest tightness or chest pain may be present
- At the **end** of the attack a small amount of viscid sputum (mucous **pellets**) may be expectorated.
- The attacks resolve spontaneously or with therapy.

Signs:**A- Signs of airway obstruction:-**

1. **Breath S:-** Vesicular breath sounds with prolonged expiration.
2. **Add. S:-**
 - Generalized rhonchi, mainly expiratory, usually sibilant & polyphonic.
 - Crepitations may occur (expiratory & changing with cough)
3. **Accessory muscle of expiration:-**

B- Signs of hyperinflation :-

- Barrel shape chest – Hyper resonance – Low diaphragm

In between the attacks the chest is usually free.

Classification of Asthma Severity (European Respiratory Society)

Stage	Symptoms	PEFR
I - Mild intermittent	<2 times \ week	>80%
II - Mild persistent	2 times\ week (not daily)	>80%
III - Moderate	Daily symptoms + Daily treatment.	60-80%
IV - Severe	Continual symptoms Limited physical activity.	>60%

Acute severe asthma: (Status asthmaticus)

Definition:- It is the severest form of asthma in which bronchodilators are ineffective in relieving the attack after several hours.

Manifestations of severe asthma include :-

History	General signs:-
- Previous intubation - Frequent hospitalizations - Prolonged attack - Pneumothorax/ pneumomediastinum - Lack of response to treatment	- Patient sitting upright or leaning forward - Dehydration - Pulses paradoxus - Tachycardia > 120 beats/min - Cyanosis - Unable to speak more than 1-2 words - Altered mental status
Local signs:- Accessory muscles use - Silent chest	
Laboratory:- PEFR less than 30-50% predicted- Hypercapnia & severe hypoxemia	

Differential Diagnosis:-**1. Upper airways**

- Vocal cord dysfunction
- Neoplasm
- Infection (diphtheria)
- Laryngeal:- edema, spasm (tetany), malacia - web

2. Vascular and other lesions

- Cardiac asthma
- Vasculitis:- PAN
- 1ry pulmonary hypertension
- Vascular rings
- Carcinoid syndrome

3. Lower airways

- COPD
- Bronchial neoplasm
- Aspiration of foreign bodies
- Aspergillosis
- Cystic fibrosis
- Mediastinal masses
- Loeffler syndrome
- Bronchiolitis syndromes
- Bronchiectasis
- Sarcoidosis
- Amyloidosis
- Bronchopulmonary dysplasia

Paroxysmal dyspnea: (AHLAM) - Asthma (bronchial, cardiac, uraemic) -Hysterical -
Laryngismus stridulus (Tetany) - Allergic alveolitis - Myasthenia crises

Complications:-

- Acute severe asthma (status asthmaticus)
- Allergic bronchopulmonary aspergillosis which may lead to proximal Bronchiectasis, fibrosis or collapse
- Complications of severe cough
- Complications of therapy e.g. steroids
- Cor-pulmonale & right sided heart failure
- Growth retardation in children with severe cases
- Pneumothorax & pneumomediastinum
- Pulmonary infections
- Respiratory failure

Investigations: (*aetiological 4 + images 3 + functional 2*)**Aetiological:-**1- Sputum examination:

- Eosinophils (the sputum is purulent even without infection)
- Curschman's spirals & Charcot-Leyden crystals may be present

2- Blood picture:

- Eosinophilia
- Marked eosinophilia detected in aspergillosis or vasculitis

3- Serum IgE :- increased in 60% of cases of extrinsic asthma.4- Skin test:- identify the causative antigen in extrinsic asthma.**Imaging:-**1- Chest X-ray:

- During the attack : signs of hyperinflation
- Pneumothorax & pneumomediastinum may be present
- In aspergillosis: proximal bronchiectasis, fibrosis & collapse

2- Ultrasonography:

- Limited to the evaluation of mediastinal masses or pleural disease.

3- Nuclear medicine:

- Tc-99m radioaerosol lung scintigraphy

Functional and severity:-1- Pulmonary function test :- (During the attack)

- Obstructive hypoventilation: decreased PEFR & FEV₁, which improve with bronchodilators. (Increased residual volume with chronicity)

Bronchial provocation test:- with histamine or methacholine or exercise
(*Non recommended if the FEV less than 65%*)

2- Arterial blood gases:

- Decreased PO₂ or increased PCO₂ in severe cases.

Treatment

A- General roles
B- Acute attack
C- Long term
D- Pharmacology

A- General roles:-

- Avoidance of exposure to triggering factors
- Treatment of respiratory infections : if present
- Treatment of upper respiratory infections: especially chronic sinusitis.

B- Management of acute asthmatic attack:

- Inhaled B₂ - stimulant e.g. Salbutamol 2 puffs
- And/or aminophylline 250-500 mg slowly intravenously.

If there is no response considered as **severe asthma**

- Management of severe attack (status asthmaticu):-

1 - Admission to hospital: preferably in respiratory ICU.

2 - B₂ stimulants :- given by IPPB (intermittent positive-pressure breathing) or nebulizer e.g. 5 mg salbutamol + O₂

- OR- Salbutamol IV infusion 250 ug over 10 min

3- Aminophylline:- given by IV infusion

Loading dose: 5.6 mg/kg in 15-30 min followed by maintenance dose 0.6 mg/kg/h (After 36 hours: plasma level should be measured & the optimum level is 10-20 ug/m)

4- If there is no response **steroids** are added

e.g. Methylprednisolone Na succinale 2 mg/kg IV followed by 1-2 mg/kg/6h followed by oral prednisone 60 mg/d orally then the dose is reduced by 5 mg every 3 days.

5- **Subcutaneous epinephrine and terbutaline.**

6- **Oxygen** inhalation: using nasal prongs or mask

7- Intravenous or oral **fluids** to correct dehydration

8- Correction of **electrolyte** imbalance

9- Resistant severe cases may require **mechanical ventilation.**

10- **Other drugs**

Magnesium infusion counteraction ca-mediated smooth-muscle spasm

Ketamine:

Heliox: mixture of helium and oxygen improve ventilation

C- Long term management depending on asthma severity:-
called Stepwise approach:

Stepwise approach:

Step	Approach	Drugs	Alternatives
I	No daily drugs	As needed - Inhaled cortisone (<i>Small doses</i>)	- Inhaled short acting B_2 agonist (low doses) - Di sodium cromoglycate
		<i>(Less to be used:- theophylline or leukotriene modifier)</i>	
II	One drug daily	As I + Long-acting B_2 agonist (<i>inhaled or tablets</i>)	Oral <u>cortisone</u> (<i>small dose</i>)
III	One or more	As II + Long-acting B_2 agonist (<i>inhaled or tablets</i>)	<u>Theophylline</u> Oral <u>cortisone</u> (<i>median dose</i>)
VI	Must be more than one drug	Inhaled <u>cortisone</u> (high doses) + Oral or syrap <u>Cortisone</u> (2mg/kg/d) + Long-acting B_2 agonist (inhaled or tablets) Or - Sustained-release <u>theophylline</u> .	

Asthmatic Bronchitis:-

It is a term used to describe patients having chronic bronchitis with any of the following features:-

1. History of asthma
2. Variation of symptoms:-

Diurnal: more in early morning

Seasonal : more in spring & summer.

3. Sputum & blood eosinophilia.
4. Improvement of FEV1 & PEFR with bronchodilators & steroids

Severe asthma :- defined as disease that is unresponsive to current treatment, including corticosteroids (5-10% of all patients are affected)

Steroid-resistant asthma unresponsiveness to the administration of high dose of steroids (10-14 day course of 20 mg or more, twice daily, of prednisone)

Steroid-dependent asthma asthma that can be controlled only with high doses of oral steroids.

D- Pharmacology (Anti-asthmatic drugs):-

A- Prophylactic drugs

B- Bronchodilators

- Sympathomimetics
- Xanthines
- Anticholinergics
- Leukotriene modifiers

C- Corticosteroids

D- Other drugs & Immunotherapy

A- Prophylactic drugs

Mast cell membrane stabilizer (usually effective in children):-

- 1- **Disodium cromoglycate (Intal)**:- 2 puffs/6 h (puff = 1 mg) by spinhaler or metered dose inhaler.
- 2- **Nedocromil sodium sodium**
- 3- **Kitotifen. (Zaditen)** Also has antihistaminic activity – 1 mg BID.

B- Bronchodilators**1- Sympathomimetics**

A- Selective B2 stimulants

- Short acting:

	Inhaler	Oral	2 puffs/3-8 hs or 1-2 tab t.d.s.
<i>Salbutamol</i>	Puff = 100 ug	Tab = 2 mg	
<i>Albuterol</i>	puff = 90		
<i>Terbutaline</i>	Puff = 250 ug	Tab = 5 mg	
<i>Orciprenaline</i>	Puff = 750 ug	Tab = 20 mg	

May be given parenterally in severe cases (the fastest and most effective)

Other routes e.g.:-

Terbutaline Subcutaneous : 0.01 mg/kg SC.

IV infusion : 0.1-10 ug/kg/min IV

- Long acting:- Salmeterol**B- Non-selective adrenergic stimulants***Adrenaline*: 0.5 ml 1/1000 solution SC.*Isoprenaline* : 10 mg sublingually or by inhalation*Ephedrine* : 30 mg orally

Of a little use because of side effects

2- Xanthines (inhibition of phosphodiesterase)

- They include theophylline & aminophylline
- Intravenously, orally or per-rectum.

3- Anticholinergics:*Ipratropium* bromide inhaler (20-40 pg. t.d.s.)*Oxitropium* bromide

Especially effective in asthmatic bronchitis

4- Leukotriene modifiers :

C- Corticosteroids:- (Anti- inflammatory action)1-Inhaled steroids:- e.g.

- Beclomethasone (Becotide inhaler: 2 puffs/2-6 h, puff = 50 ug)
- Budesonide

Side effects: oropharyngeal candidiasis or hoarseness of voice .

2- Oral steroids: e.g. Prednisone (20-40 mg/d)

May be given in resistant cases.

3- Parenteral steroids: e.g. Methylprednisolone or Hydrocortisone

May be given in severe cases

Side effects:- hyperglycemia, hypertension, hypokalemia, psychosis, susceptibility to infections, myopathy.

D- Other drugs & Immunotherapy:

- Other drugs:- as methotrexate, cyclosporine & gold)

Under trial for treatment of patients with severe chronic asthma.

- **Immunotherapy (hyposensitization)**

Extracts of the allergen injected ID in gradually increasing doses. It results in production of IgG (blocking antibodies) which prevent binding of the allergen to IgE.

ASTHMA SUMMARIZED AS,

- *Episodic of dyspnea, cough, wheezing and chest tightness*
- *Symptoms frequently worse at night or in the early morning*
- *Physical examination revealed prolonged expiration and diffuse wheezes*
- *Limitation of airflow on pulmonary function testing.*
- *Complete or partial reversibility, either spontaneously or after therapy.*

R e s p i r a t o r y F u n c t i o n T e s t s

Tests for Ventilation :- Using the spirometry

1. Tidal Volume (TV)

- Volume of air inspired or expired during normal quiet breathing = 500 ml.

2. Forced Vital Capacity (FVC)

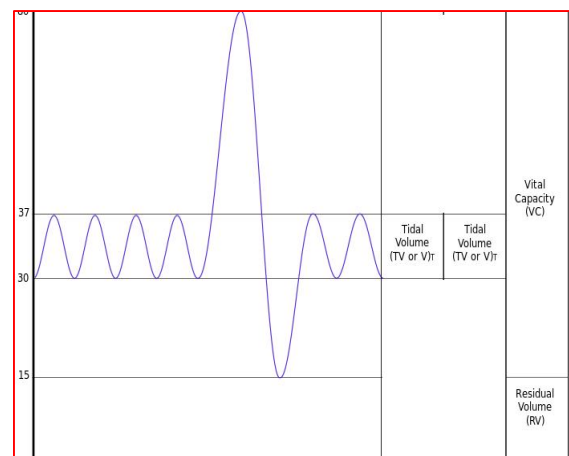
- Volume of air maximally expired after maximum inspiration = 4-5 L

3. Residual Volume

(increases in **obstructive** hypoventilation)

- Volume of air remaining in the lungs after maximum expiration.

- It is measured by Helium dilution method = 1200 – 1500 ml.



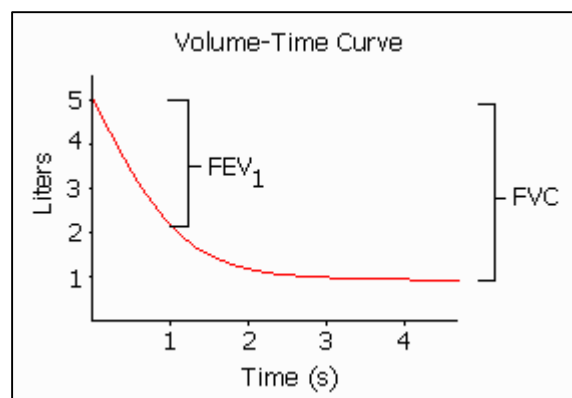
Tests for Expiration :- (decreased in **obstructive hypoventilation**)

1. Forced expiratory volume in the first second (FEV₁) = 3-4 L

2. Timed vital capacity (FEV₁/VC) = 80%

3. Peak expiratory flow rate (PEFR):- bed-side test for checking airflow, used for grades and severity assessment (as in asthma grades)

4. Maximal expiratory flow rate (MEFR)



Others:

1. Maximum Breathing Capacity (MBC)

The patient is asked to breathe as deep & as rapid as possible = 110-130 L/min

2. Pulmonary compliance : Normally = 0.166-0.246 L/cm H₂O

3. Ventilation scan : using Xe.

Tests for Perfusion :

- Measurement of pulmonary vascular pressures

- Perfusion lung scan : using Xe-labelled macroaggregated albumin.

Tests for Diffusion:

CO-transfer factor

Tests for all respiratory functions:- Arterial blood gases for O₂ & CO₂ (ABG)

R E S P I R A T O R Y F A I L U R E

Definition:- Laboratory diagnosis characterized by hypoxia with or without Hypercapnia due to respiratory disease.

<u>Aetiology:</u>	<u>Types:</u>
A- Hypoventilation B- Impaired diffusion C- Ventilation/Perfusion (V/Q) imbalance	- Hypoxemic type (type I) hypoxia & normo-or hypocapnia. - Hypercapnic type (type II) hypoxia & Hypercapnia - Mixed Type

A- Hypoventilation

1- Obstructive :

- Upper respiratory tract obstruction:
 - Laryngeal oedema, tetanus, inhaled foreign body or food.
- Lower respiratory tract obstruction:
 - Chronic obstructive bronchitis.
 - Emphysema
 - Bronchial asthma

2- Restrictive (decreased compliance)

- Interstitial pulmonary diseases
- Pneumothorax (tension or bilateral), massive pleural effusions, fibrothorax.
- Extreme obesity (Pickwickian syndrome), crushed chest injury, severe chest deformities, scleroderma & ankylosing spondylitis
- Neuromuscular disorders:- Head injury, cerebrovascular accidents, sedative overdose, alkalosis, sleep apnea syndrome & Cervical cord lesions.

Manifestations:- **Hypoxia & Hypercapnia**

B- Impaired Diffusion:

- Interstitial pulmonary diseases
- Emphysema
- Pulmonary oedema
- Pulmonary embolism
- Pneumonia

Manifestations:- **Hypoxia & Normo – or Hypocapnia.**

Clinical Picture: Respiratory failure may be acute or chronic

- Manifestations of hypoxia
- May be manifestations of Hypercapnia
- Manifestation of the cause e.g. features of COPD.

	- <u>Acute</u>	- <u>Chronic</u>
<u>Hypoxia</u>	- Central cyanosis - Dyspnea, tachypnea - Tachycardia, hypotension - Drowsiness, coma & convulsions. - Death	- Central cyanosis - Clubbing - Cor-pulmonale - Erythrocytosis - Apathy, fatigue, drowsiness.
<u>Hypercapnia</u>	- Tachycardia, BP may be normal, low or high - Sweating - Flapping tremors - Drowsiness & coma - Death	- Headache - Drowsiness & hypersomnia (CO₂ narcosis) - Flapping tremors - Increased ICT & papilloedema.

Respiratory function tests:-

Measurement of arterial blood gases (PO₂ & PCO₂), PH & HCO₃
Investigations for diagnosis of the cause.

Treatment:-

Admission to hospital : preferably in respiratory ICU

A- Improvement of ventilation:

- Maintenance of patent **airways**
 - Aspiration of retained secretions.
 - Encourage the patient to cough.
 - Respiratory exercises.
- Liquefaction of **sputum**:
 - Adequate hydration
 - Mucolytics e.g. bromhexine
 - Expectorants e.g. potassium iodide.
- Respiratory **stimulants** :- e.g. doxapram

B- Oxygen inhalation**C- Mechanical ventilation****D- Treatment of the cause****E- Treatment of precipitating factors & complications: e.g.**

- Pulmonary infections
- Heart failure
- Gastrointestinal haemorrhage.

C h r o n i c O b s t r u c t i v e P u l m o n a r y D i s e a s e

Definition:- coexisted chronic obstructive bronchitis & emphysema

Chronic obstructive bronchitis:- disease characterized by cough daily or most of days for about 3 months / year for 2 successive years

Emphysema:- disease of respiratory unit dilatation, with or without damage of alveolar wall

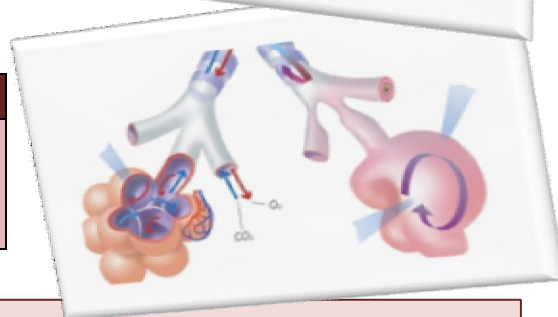
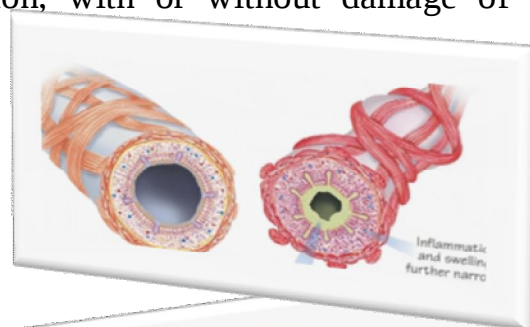
Aetiology:-

Chronic obstructive bronchitis:-

- 1- Irritation:- **smoking** & pollution
- 2- Allergy
- 3- Infection

Emphysema:-

False	True
Senile	Primary:- alpha 1 antitrypsin deficiency.
Compensatory	Secondary:- Infections - obstruction
Congenital	



Pathological stages of Chronic obstructive bronchitis

1- Simple chronic bronchitis:- reversible chronic irritation of bronchi with excessive mucus secretion (e.g. smoking cough)

2-Muco-purulent chronic bronchitis:- recurrent infection of the bronchi

3- Obstructive chronic bronchitis:- irreversible narrowing caused by (sub-mucosal thickening - sub-mucosal inflammatory cell infiltration - muscular hypertrophy) - usually complicated with emphysema.

Pathophysiology:-

Chronic obstructive bronchitis	Emphysema
<u>Respiratory dysfunction:-</u> - Obstructive hypoventilation - Hypoxaemia & hypercapnia <u>Later on pulmonary hypertension & cor-pulmonale (R V F)</u> - Hypercapnia decreases the sensitivity of respiratory centre. So no dyspnea. Type B - bronchitic Type or "Blue Bloater".	<u>Respiratory dysfunction:-</u> - Diffusion defect (decreasing surface area) - Hypoxia + normo- or hypocapnia. - Sensitivity of respiratory centre is normal (no hypercapnia) severe dyspnea Type A, emphysematous Type "Pink puffer"
<u>Cor pulmonale:-</u> - Hypoxia: resulting in vasoconstriction of pulmonary arterioles. - Reduction of the pulmonary vascular bed.	

Clinical picture**Symptoms:-**

Patient:-	Male, chronic heavy smoker & above 50 years
Bronchitis:-	Long history of chronic cough with mucoid or mucopurulent expectoration.
Emphysema:-	Dyspnea is gradual progressive occurring initially on exertion but later on at rest ± wheeze
Complications:-	Chest pain (Chronic cough, pneumothorax) Respiratory failure Oedema of lower limbs (RVF)

Signs:**1- General examination (A, B, C, E & F):-**

A	<u>Pulse:</u> Tachycardia & big pulse volume hyperdynamic c. (hypercapnia & hypoxia) Small pulse volume severe pulmonary hypertension ± heart failure Pulsus paradoxus may be present in severe cases <u>Respiratory rate:</u> Tachypnea with working accessory respiratory muscles.
B	
C	Cyanosis (in severe hypoxia)
D	May be Orthopnic
E	<u>Head & neck examination :-</u> - Central cyanosis may be present - Puffiness of eyelids due to chronic cough - Congested neck veins (increased intrathoracic pressure - Cor-pulmonale - RVF) <u>Upper limb:-</u> - Clubbing if there is associated bronchiectasis <u>Lower limb:-</u> Oedema of the lower limbs may occur due to cor-pulmonale
F	Drowsiness :- Sign of respiratory failure

Abdominal examination:-

Palpable liver due to :-

- Depression of the liver by flat diaphragm (not tender)
- Congested liver due to cor pulmonale (tender)

Ascites may be present: due to right-sided heart failure

2- Local Chest examination:-

Inspection	- Barrel chest - Bilateral limitation of expansion - Weak or absent cardiac pulsations	Hyperinflation
Palpation	- Trachea is central - TVF is decreased bilaterally	
Percussion	- Hyperresonance - Encroachment on cardiac & hepatic dullness.	
Auscultation	- Vesicular breath sounds with prolonged expiration (harsh) - Generalized wheezes (rhonchi) - Minimal crepitations may occur	Obst.

Complications:

<u>Local</u>	<u>Extra-thoracic</u>
<u>Respiratory</u> - Respiratory failure - Infections - Bronchial obstruction - Pneumothorax	<u>CVS:-</u> Cor pulmonale Right-sided heart failure Left-sided heart failure Thrombembolism Erythrocytosis <u>Renal:-</u> Salt & fluid retention Proteinuria <u>GIT:-</u> Peptic ulcer
Complications of chronic cough (see symptomatology)	

Investigations:**Chest X-ray:-****Hyperinflation:**

- Hypertranslucency of the lungs
- Transverse & wide intercostals spaces.
- Low flat diaphragm
- Ribbon-shaped heart

Exaggerated broncho-vascular markings
 (chronic obstructive bronchitis)
**Respiratory function tests:-****Ventilation tests:**

- Residual volume (RV) is increased.
- Forced vital capacity (FVC) usually decrease
- FEV1, timed vital capacity & PEFR are decreased

Diffusion tests: CO transfer factor is decreased**Arterial blood gases:-** Decreased PO₂, increased PCO₂

Sputum culture & sensitivity : may detect organisms (pneumococci & H. influenza)

Blood picture : may show erythrocytosis.

Treatment:

General :-

- Avoidance of the cause (bronchial irritation or infection):
- Cigarette smoking should be stopped
- Changing residence
- Proper treatment of upper respiratory infections
- Pneumococcal vaccination

Infection on top of COPD diagnosed if there is a purulent non eosinophilic sputum

Symptomatic treatment:

- Mucolytics e.g. bromhexine hydrochloride (bisolvon)
- Expectorants e.g. potassium iodide
- Bronchodilators:- e.g.
 - Ipratropium bromide by inhalation
 - Aminophylline IV or orally
 - Steroids (in resistant cases)

Treatment of complications: e.g.

- Respiratory failure
- Heart failure
- Erythrocytosis : venesection may be needed

Oxygen therapy (long term)

- It is indicated in:-
 - Severe hypoxia
 - PO₂ <40 mmHg with exertion or <55 mmHg at rest
- Values :- Decrease complications.
 - Improve symptoms, exercise tolerance, quality of life & survival.

Lung transplantation: is the only radical treatment.

INTERSTITIAL PULMONARY DISEASE

= Pulmonary Fibrosis

Definition:- Group of lung diseases affecting the interstitium and usually progress to fibrosis

Aetiology: (3I, 2C , 2M)

- **Idiopathic pulmonary fibrosis (IPF)**
- **Immune diseases :-**
- **Inhalational lung diseases:**
 - Extrinsic allergic alveolitis: (due to inhalation of organic dust)
 - e.g. - Farmer's lung.
 - Bagassosis.
 - Bird fancier's disease
 - Pneumoconiosis: (due to inhalation of inorganic dust)
 - e.g. – Silicosis
 - Asbestosis
- **Chronic pulmonary diseases (Granulomatous):** e.g. Sarcoidosis.
- **Chronic pulmonary venous congestion.**
- **Familial:-** Histiocytosis X. –Neurofibromatosis.
- **Malignancies:-** Lymphangitis carcinomatosa.
 - Bronchoalveolar carcinoma.
 - Lymphomas & Leukaemias.
- **Miscellaneous** – Idiopathic haemosiderosis.
 - Alveolar proteinosis
 - Alveolar microlithiasis

Pathophysiology:

1. Impaired diffusion
2. Restrictive hypoventilation
3. Hypoxia with normo or hypocapnia.

Clinical picture:-

Gradual progressive **dyspnea**

Cough

Central Cyanosis

6C

Clubbing

Crepitations:- late or pan-inspiratory medium-sized, non-consonating.

Cause e.g. occupational exposure to dust.

Complications: - Respiratory failure.

- Pulmonary hypertension & Cor pulmonale

Investigations:**1- Chest X-ray:**

Bilateral diffuse affection of lungs with reticulations & micronodular infiltrations (usually basal).

2- Pulmonary function tests:

Ventilation test:-

_ **Decreased** lung volumes especially FVC.

_ **Decreased** lung compliance

_ Normal expiratory flow rates

Diffusion tests:- **Decreased** CO transfer factor.

Arterial blood gases:- **Decreased** PO₂.

Normal or **Decreased** PCO₂

**3- Investigations for the cause****Disease activity:**

Bronchoalveolar lavage:- for detection of type and amount of inflammatory cells

Open lung biopsy:- (inflammatory cells > fibrosis)

Differential Diagnosis:

- Causes of respiratory failure
- Causes of hypoxic cor-pulmonale.

Treatment:

1. Treatment of the cause
2. If the condition is of unknown aetiology e.g. IPF:
 - _ Steroids: **prednisone 1** mg/kg/d.
 - _ Cytotoxic drugs: e.g. Cyclophosphamide.
3. Symptomatic treatment: e.g. oxygen therapy.
4. Treatment of complications:-
 - Pulmonary infections.
 - Respiratory failure
 - Heart failure.
5. Lung transplantation is the only therapeutic option available in severe case

Idiopathic Pulmonary Fibrosis

(Hamman – Rich Syndrome)

Pathological types include:

Mural type (Bad prognosis)	Desquamative type
Extensive fibrosis	Minimal fibrosis
Minimal cellular infiltration	Marked cellular infiltration
Poor response to steroids	Good response to steroids

Radiologic types include:

- Generalized type.
- Upper lobe type.
- Lower lobe type.

Clinical picture - Investigations:- as Lung Collapse

Treatment:- as above

L U N G C O L L A P S E (A T E L E C T A S I S)

Definition:- Reduced aeration of the lung

Aetiology:-

A- Congenial collapse:

- Congenital non-expansion
- Aspiration: of amniotic fluid or mucus during labour
- Patchy collapse:- in respiratory distress syndrome of the newboen.

B- Acquired collapse:

1- Obstructive (Absorption) collapse:

- In the lumen: foreign body, thick secretions, vomitus or blood.
- In the wall: tumours or strictures.
- Pressure from outside: LN, tumours or other causes of mediastinal syndrome.

2- Relaxation – compression collapse:

- Pneumothorax
- Pleural effusion
- Hydropneumothorax

3- Contraction collapse:

- Due to fibrosis

4- Patchy collapse:- in adult respiratory distress syndrome (ARDS)

Clinical Picture:**Symptoms:**

In mild cases : the condition is asymptomatic

In severe & acute cases : Sudden onset of severe progressive

- Dyspnea, chest pain, cough & wheeze.
- Cyanosis, shock & acute right ventricular failure may occur.

Symptoms of complications

Signs:- According to the type of collapse

Obstructive & contraction collapse:

Inspection	Retraction of the affected side Diminished movements over the collapsed area.
Palpation	Mediastinal shift to the same side TVF is diminished.
Percussion	Dullness that may take the topography of a shrunk lobe.
Auscultation	Absent or decreased breath sounds. May be crepitations and/or rhonchi.

Relaxation-compression collapse:

Features of the cause e.g. pneumothorax.

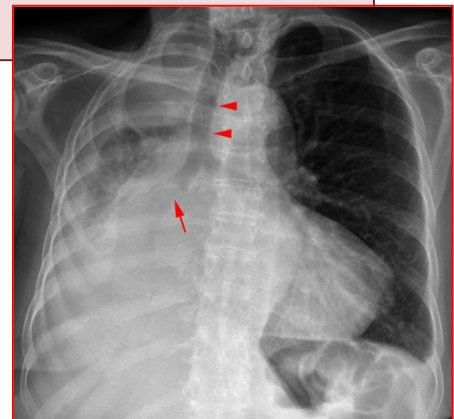
Patchy collapse: Features of ARDS.**Massive post- operative lung collapse:-**

- Lack of pre-anesthetic medication.
- Bronchial irritation by anaesthetics especially in cases of chronic bronchitis.
- Lack of proper aspiration of secretions following operations.
- Inability to cough after surgery because of pain

Investigation

X-ray:- - The collapsed lung appears as hilar opacity with ribs over crowded - diaphragmatic tented - mediastinal shift to the same side
- Feature of the cause

Respiratory function tests :- as in interstitial lung disease

**Complications:-** As usual +

- Failure of re-expansion
- Respiratory failure in massive collapse

Treatment:

- Treatment of the cause
- Treatment of the complications (ttt of respiratory failure)

T u b e r c u l o s i s

Two forms

	Primary (Childhood)	Post – Primary Tuberculosis Reactivation – Adulthood – Secondary
Aetio	Infection from patients with open TB (droplet).	Endogenous: reactivation of residual primary lesion. Exogenous: reinfection.
Pathology	<u>Primary immune complex:-</u> 1. Gohn's focus 2. Regional lymphadenitis 3. Lymphangitis <u>Hypersensitivity (6 weeks)</u> 1. Epi-tuberculosis:- Homogeneous opacity lung (lobar or segmental consolidation) 2. Pleural effusion 3. Erythema nodosum 4. Phlyctenular conjunctivitis 5. Positive tuberculin test	Localization & greatly intensified 1. Fibrocaseous:- Big cavity surrounded by little fibrosis. 2. Fibroid:- Small cavities surrounded by excessive fibrosis. 3. Endobronchial:- Tuberculous of bronchi connected to cavities. 4. TB bronchopneumonia & Miliary tuberculosis:- in immunocompromised patients.
Fate	<u>Healing:</u> fibrosis ± calcification <u>Haematogenous spread</u> <u>Progression</u> - Pulmonary component - Glandular component	

Clinical picture

A- symptoms:-

Called Active primary tuberculosis <u>Pulmonary component:-</u> - TB pneumonia - Primary cavitation - Pleural effusion <u>Glandular component:-</u> - Pressure on a bronchus - Complete:- (collapse) - Partial:- emphysema or bronchiectasis - Mediastinal syndrome. - Ulceration in a bronchus:- bronchopneumonia. <u>Haematogenous :-</u> Military TB	<u>General:-</u> Chronic:- TB toxemia (night sweat, night fever, anorexia & loss of weight). Acute:- Flu-like or typhoid-like <u>Local:-</u> Productive cough:- mucopurulent coin-shaped (nummular sputum) Haemoptysis: - blood-streaked sputum - or frank haemoptysis. Dyspnea: may occur due to consolidation, cavitations, fibrosis, pleural effusion or pneumothorax. Chest pain
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Signs:-

<u>Marked systemic manifestations:</u> - Fever & sweats - Anorexia, weight loss & fatigue. - Meningitis - Lymphadenopathy - Hepatosplenomegaly - Fundus examination: choroid TB	<u>General signs:-</u> Loss of weight, pallor, toxic face, fever & uncommonly mild clubbing. <u>Local signs:</u> - Signs of apical cavitation with fibrosis & consolidation (the commonest). - Marked fibrosis, bronchiectasis or pneumonia - Pleura: Pleurisy, effusion or pneumothorax
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Extra- Pulmonary TB
(Haematogenous Tuberculosis)

A- Intra-thoracic:

1. Lymphatic: tuberculous lymphadenitis.
2. Pleura diseases
3. Heart:- pericardium – endocardium & myocardium-
4. Chest wall:- SC abscess – empyema necessitatus – osteomyelitis.

B- Extra-thoracic : (G)

Genitourinary:- kidneys, ureters, bladder, prostate, epididymis, seminal vesicles, Fallopian tubes, ovaries, uterus.

GIT:- TB enteritis (ileocaecal)- peritonitis – liver, spleen.

Skin :- e.g. lupus vulgaris – soft tissue abscesses.

Skeletal :- spondylitis, Pott's disease – osteomyelitis – arthritis.

C.N.S.:- meningitis – tuberculoma

Lymphatic :- tuberculous lymphadenitis.

Others:- laryngeal – middle ear – eye : uveitis, conjunctivitis.

Disseminated & military tuberculosis.

Complications:-

- Pulmonary fibrosis & bronchiectasis
- Pleural involvement : (all diseases)
- Secondary amyloidosis
- Aspergilloma formed in a tuberculous cavity.
- Spread:-Haematogenous–Lymphatic–Transbronchial- Intracanalicular

Investigations (Laboratory - image - bacteriology - others - tuberculin)**1- Laboratory:-**

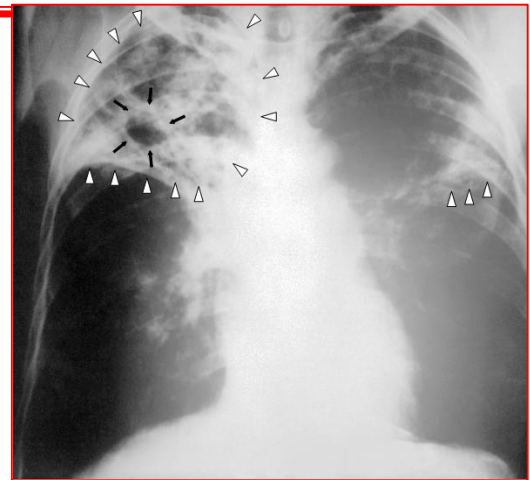
1. ESR: markedly elevated
2. C-reactive protein : elevated
3. Blood picture:-
 - Normocytic anaemia
 - Leucopenia with lymphocytosis & monocytosis.

2- Imaging:**1. Chest X-ray:-**

- Apical cavitation surrounded by fluffy opacities.
- Bronchopneumonia: multiple irregular patches scattered in the lungs.
- Miliary shadows.
- Others:- fibrosis, calcification, pleural affection

Radiological tuberculous lesions classified into:

Stage	Cavity	Lesions
Minimal	No	Less than the 2 nd rib
Moderate	<4 cm	Less than the 4 th rib
advanced	>4 cm	Beyond the 4 th rib or bilateral lesions.

**2. CT chest: accurate for diagnosis & localization of the lesions.****3- Bacteriological investigations:**

usually for sputum In absence of sputum : broncho-alveolar lavage, gastric lavage & laryngeal swab may be used

- Ziehl-Neelsen stain & repeated for 6 times at least
- Culture & sensitivity test using Lowenstein – Jensen medium.
- Culture using Bac-Tec.
- Animal inoculation in guinea pig.

4- Tuberculin testing:

- Injection of 0.1 ml of 1/10.000 PPD intradermal in the front of forearm.
- The result is recorded after 72 hours.

Tuberculin-positive cases there is indurated area 10 mm or more in diameter.

1. Positive test indicates **active** or **old** TB infection or BCG **vaccination**.
2. Positive test in **children** below 3 years usually indicates **active infection**
3. Chest lesions with negative test are most probably not **tuberculous**.
4. Tuberculin-negative adults exposed to infection as doctors & nurses should receive **BCG**

False negative	False positive
1. Pre-allergic phase 2. Fulminant as military tuberculosis. 3. In association with lymphomas, AIDS, sarcoidosis & viral infections (e.g. measles) 4. Corticosteroid therapy. 5. Inactive tuberculin 6. Old patients	1. Atypical mycobacteria 2. Nocardia 3. Corynebacteria

5- Others :-

Biopsy:- Show characteristic granulomatous lesions consisting of a central area of caseation surrounded by lymphocytes, epithelioid cells, Langhan's giant cells & fibroblasts. T.B. may be detected.

Immunological:

- Detection of mycobacterial DNA by **PCR**
- Detection of serum IgG against mycobacterial antigens.

Treatment: (Prophylactic- General- Specific)**A- Prophylactic treatment:-****1- BCG vaccination: (Bacille Calmette Guerin)**

Indication

- For all neonates in countries with a high incidence
- High-risk groups e.g. :- contacts, health workers
- Patients on long-term immunosuppressive therapy.

2- Chemoprophylaxis using INH : 5 mg/kg/day

- Contacts of TB patients with recent tuberculin conversion.
- Immunocompromised with previous TB.

B- General care:

- Rest in bed in acute phases
- Proper nutrition.
- Symptomatic treatment : e.g.
 1. Antipyretics for fever.
 2. Expectorants & mucolytics for productive cough.

C- Specific treatment:- (Lines - principles - regimen)**Lines (drugs)**

1st line (IRSEP)

<u>Drug</u>	<u>Dose</u>	<u>Side effects</u>
Isoniazid (INH)	5 mg/kg/day	Induce lupus - Polyneuropathy Hepatotoxicity
Rifampicin	10 mg/kg/day	GITD – Hepatotoxicity. Flu-like – Thrombocytopenia. Red colouration of urine, tears & sweat.
Streptomycin	15 mg/kg/day IM	Oatotoxicity Renal toxicity Hypersensitivity
Ethambutol	25 mg/kg/day	Optic neuritis.
Pyrazinamide	30 mg/kg/day	Hyperuricaemia & gout

2nd line

<u>Ethionamide</u>	50 mg/day	G.I. irritation, hepatotoxicity & peripheral neuropathy.
<u>Para-amino salicylic acid (PAS)</u>	10-15 gm/day	GITD – Hypersensitivity Thrombocytopenia. Glandular fever-like
<u>Other drugs</u>	Cycloserine – Kanamycin – Amikacin – Capreomycin – Thiacetazone	

Principles of Therapy:

- Combined anti-tuberculous chemotherapy.
- Long duration of therapy is required.
- Orally given drugs are taken half an hour before breakfast.

Regimens of anti-tuberculous therapy:

Regimen	Duration	Drug used	Add for first 2 months
Very short	6	INH + Rifampicin	Pyrazinamide + Ethambutol or Streptomycin
Short	9-12	As above	Ethambutol or streptomycin
Classic	15, 18 or 24	As above	Ethambutol or Streptomycin
Standard	15,18 or 24	Isoniazid, PAS	Streptomycin (not used)

Steroids:- (under cover of antituberculous drugs - small doses - short duration) for

1. Tuberculous serositis (pericardial, pleural & peritoneal)
2. Tuberculous meningitis.
3. Fulminant cases e.g. military T.B.
4. Replacement therapy in tuberculosis of adrenal glands.
5. Hypersensitivity reactions to antituberculous drugs

Surgical Treatment: (Resection or Thoracoplasty)

1. Tuberculous bronchiectasis.
2. Tension cavity
3. Tuberculoma
4. Resistant cavities
(combined with a full course of antituberculous).

About TB:-

- TB follows DM like its shadow
- C/P :- any or no all chest presentation
- pathological types:- (Degenerative - proliferative -

BRONCHIAL CARCINOMA

Incidence:

Age:- commonly between 50-70 years.

Sex: more common in males.

Predisposing factors:

Cigarette smoking:

The most important factor (90%).

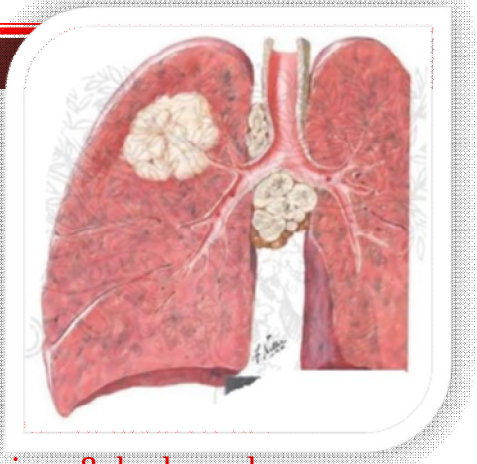
Tobacco smoke contains more than 4000 constituents including a number of carcinogenic substances

Industrial exposure : to asbestos, nickel, chromium, uranium & hydrocarbons.

Exposure to irradiation

Atmospheric pollution (more common in urban dwellers).

Rarely preexisting scar in interstitial fibrosis e.g. in scleroderma.



Pathology:-

Site

histological classification

Spread

A- Site:

Central (hilar) (common)	Peripheral tumours:
Squamous cell carcinoma.	Adenocarcinoma or large cell
- Invade the mediastinum early	- Invade the pleura early
C/P: cough, haemoptysis, dyspnea, chest pain. Bronchoscopy diagnostic in 90%	C/P: pleuritic pain Bronehoscopy diagnostic in 50%

B- Histological classification :-

1. Squamous cell carcinoma (epidermoid carcinoma) : 40-60%
2. Small cell carcinoma (anaplastic oat cell carcinoma) : 7-25%
rapid spread & high incidence of para-malignant syndromes.
3. Adenocarcinoma: 10-25% (females)
4. Large cell carcinoma: 5-15 of cases.

C- Spread: (direct - lymphatic - blood)

1) Direct spread : to surrounding parts of the lung, pleura & mediastinum.

2) Lymphatic spread:

1. To the hilar & mediastinal LN
2. Supraclavicular LN.

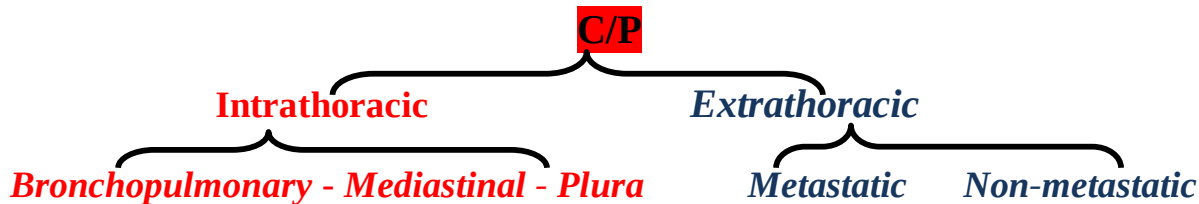
Right supra-clavicular LN.	Left supra-clavicular LN.
Right lung + Left lower lobe + lingula	Left upper lobe

3. Spread may occur to cervical, axillary & abdominal LN.
4. Retrograde spread along lung lymphatics may occur leading to lymphangitis carcinomatosa which may result in interstitial pulmonary disease & subacute cor pulmonale.

3) Haematogenous spread: e.g. to liver, bones & brain.

Clinical Picture

- Personal history:- (Age, sex & habits)
- Past history of chronic exposure for carcinogenic factors
- **Presentation** : the patient may present with a variety of manifestations including.



1- INTRA-THORACTC MANIFESTATIONS

A- Bronchopulmonary manifestations:-

1- Asymptomatic cases (5-15%)

- Accidentally discovered as a coin shadow in chest X-ray

2- Cough & Haemoptysis:

- Blood-streaked sputum, rarely a red currant-jelly sputum , Less commonly frank haemoptysis.
- **Bronchorrhea** large amounts of mucoid sputum in broncho-alveolar carcinoma (type of Adenocarcinoma)

3- Bronchial obstruction:

- Presented with dyspnea and pain
- **Partial**:- fixed localized wheeze with emphysema or bronchiectasis
- **Complete**:- collapse

4- Pneumonia:- Unresolving or recurrent in the same site.

5- Lung abscess: explained as

- _ Secondary infection in a collapsed area.
- _ Necrosis & cavitation of the tumour itself
- _ Aspiration of infected material from the tumour.

6- Features of interstitial lung disease & Sub-acute corpulmonale:

Lymphangitis carcinomatosis or bronchoalveolar carcinoma.

B- Pleural manifestations:- all pleural diseases may occur

Pleurisy, pleural effusion, chylous, empyema or transudate effusion.

Malignant effusion : (the most common type)

Haemorrhagic - massive - rapidly re-accumulating - contains malignant cells.

The mediastinum may be shifted to the same side due to underlying lung collapse.

C Mediastinal manifestations:-

1- Mediastinal syndrome:- Central tumours or mediastinal L.N.

- Pressure on
- Trachea:- cough
 - Esophagus :- dysphagia
 - Lt. Recurrent laryngeal :- hoarsness of voice

2- Pancoast Syndrome (Thoracic inlet or Superior sulcus syndrome):

Pressure on

- **Lower trunk of the brachial plexus** :- pain & parasthesias along the medial aspect of the arm, forearm & hand.
- Weakness & wasting of small muscles of the hand and flexors of the wrist.
- **Sympathetic chain** : Horner's syndrome.
- **Blood vessels in the root of the neck** : unequal pulse and BP, congested non-pulsating neck veins & dilated veins over the chest.
- **Ribs erosion**

2- EXTRA-THORACIC MANIFESTATIONS

A- Metastatic manifestations

1- Haematogenous spread: e.g.

Liver: leading to pain in right hypochondrium, jaundice, enlarged hard tender irregular liver.

Brain: leading to increased intracranial tension and focal neurological manifestations.

Bones : leading to bone pains & pathological fractures.

2- Lymphatic spread : Leading to enlargement of cervical, supraclavicular, axillary and/or abdominal LN.

B- Non-metastatic manifestation: " Para-malignant Syndromes"

- Most frequently associated with **small cell carcinoma**.

Mechanisms :- only endocrinal features of these manifestations can be explained as secretion of ectopic hormones by the tumor.

A- General:

1. Clubbing & hypertrophic osteoarthropathy.
2. Cachexia
3. Fever not related to infection

B- Neurological manifestations:

1. Subacute cerebellar atrophy.
2. Peripheral neuropathy, myopathy.
3. Myasthenia gravis, Eaton-Lambert syndrome.
4. Polymyositis, dermatomyositis.

C- Endocrinal manifestations:-

1. Hyperparathyroidism
2. Cushing's syndrome
3. Gynaecomastia
4. SIADH

D- Skin manifestations :-

1. Dermatomyositis.
2. Acanthosis nigricans.
3. Hyperpigmentation
4. Migratory thrombophlebitis.
5. Pruritus.
6. Herpes zoster

**Investigations:-****1) Chest X-ray:**

- Coin shadow in the lung
- Hilar shadow (the tumour or LN).
- Massive pleural effusion: may be associated with mediastinal shift to the same side (underlying collapse or fibrosis)
- Localized cavitation, consolidation, collapse or emphysema.
- Erosion of ribs or vertebrae
- Paralyzed diaphragm :- elevated hemidiaphragm. Paradoxical movement
- Pancoast tumour: Apical shadow & erosion of upper ribs.

2) CT chest : more accurate for diagnosis & localization of the tumour.**3) Bronchoscopy:**

- Positive in 90% of cases with central tumour & 50% of cases with peripheral tumour . Biopsy could be taken through the bronchoscope.

4) Cytological investigations: For detection of malignant cells

Specimen:- Sputum, pleural fluid, pleural biopsy, Lymph node, Transbronchial or Lung biopsy (Percutaneous needle aspiration, thoracoscopy or Open lung biopsy)

5) Laboratory investigations:

- ESR: markedly elevated
- Blood picture : usually anaemia of chronic disease.

6) Investigation for detection of metastasis

- LFTs and Abdominal ultrasound - brain Ctscan

7) Investigations for detection of paramalignant manifestation:-

- Endocrinal investigation e.g. serum Ca.

8) Investigations for Staging & Operability.

Differential Diagnosis:**A- Clinically :**

Old - male - chronic heavy smoker

+ Any Chronic recurrent, complicated or unresolving chest complains as,

Prolonged cough or haemoptysis, Pneumonia & lung abscess, localized bronchial obstruction, pleural effusion & mediastinal syndrome

- Tuberculosis.

B- Radiologically :

Differentiation from other causes of solitary pulmonary nodule (**coin shadow**):

Pulmonary tumors :- benign tumour, malignant tumour or solitary metastases.

Pulmonary infections:- T.B, pneumonic patch.

Treatment:**Choice of the treatment depends on :**

- 1) Histological type of the tumour.
- 2) Operability;
 - Adequate pulmonary function tests.
 - No evidence of hilar or mediastinal involvement
 - No evidence of extra-thoracic spread.

Lines of treatment include:**1) For non-small cell carcinoma:****A. Operable cases:**

- Pneumonectomy or lobectomy which may be followed by postoperative irradiation.

B. Non-operable cases:

- Chemotherapy: e.g. CAMP (cyclophosphamide, adriamycin, methotrexate & procarbazine).
- Palliative Radiotherapy: for treatment of pain, haemoptysis, airway obstruction or SVC obstruction.

2) For small cell carcinoma:

- **Chemotherapy** :- e.g. VP 16, cyclophosphamide & adriamycin.
- **Radiotherapy**: for treatment of the primary tumour &- prophylaxis against cerebral metastases.

3) Symptomatic treatment : e.g.

- Analgesics for chest pain
- Antibiotics for pulmonary infections.
- Aspiration of pleural effusion with intrapleural injection of cytotoxic drugs.

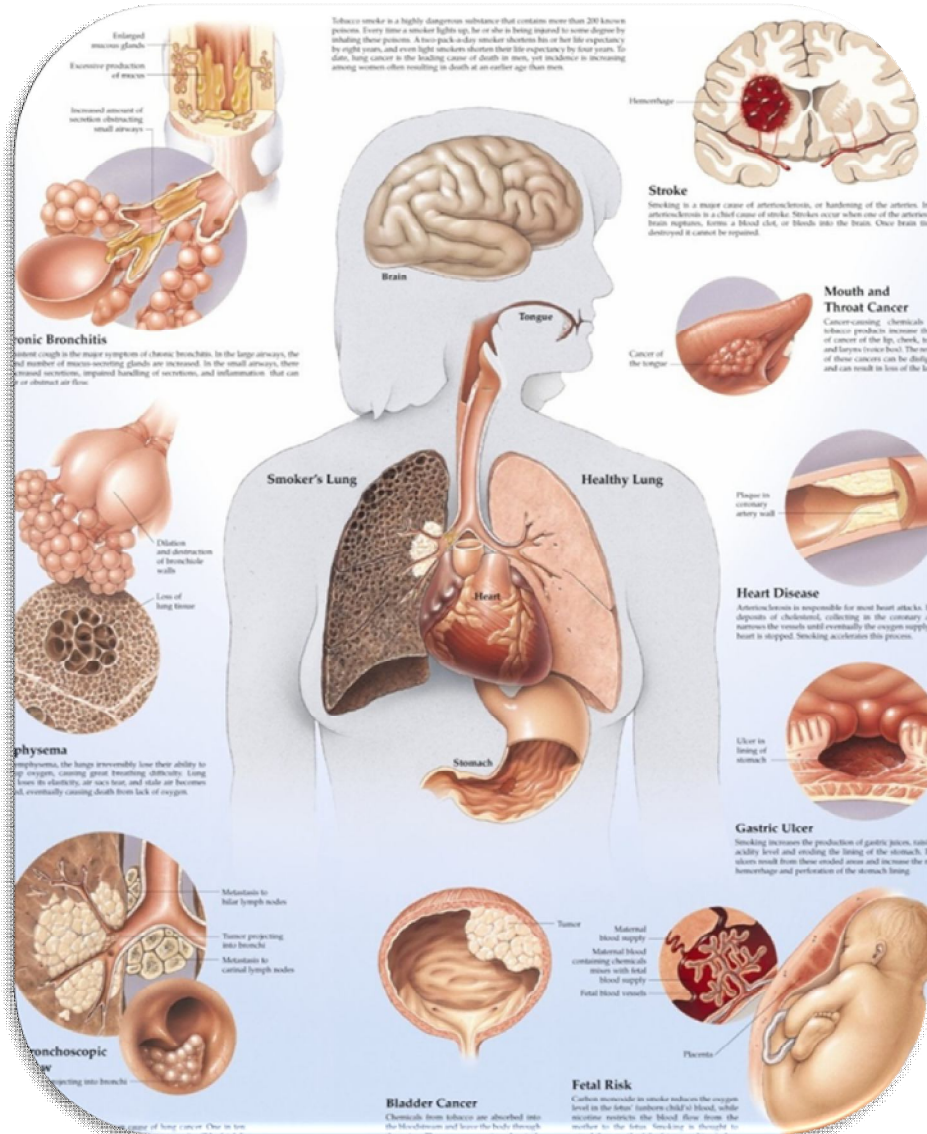
Hazards of Cigarette Smoking

Cardiovascular:-

- ♦ Coronary artery disease.
- ♦ Atherosclerotic cerebrovascular stroke
- ♦ Peripheral vascular disease :
atherosclerosis,
Buerger's disease.
- ♦ Arrhythmias e.g.
premature beats

Pulmonary:-

- ♦ Cancer
- ♦ Chronic bronchitis,
emphysema (COPD)



Cancer:-

- ♦ Lung
- ♦ Lips, tongue, larynx
- ♦ Oesophagus, pancreas
- ♦ Bladder, kidney

GIT:-

- ♦ GERD
- ♦ Peptic ulcer

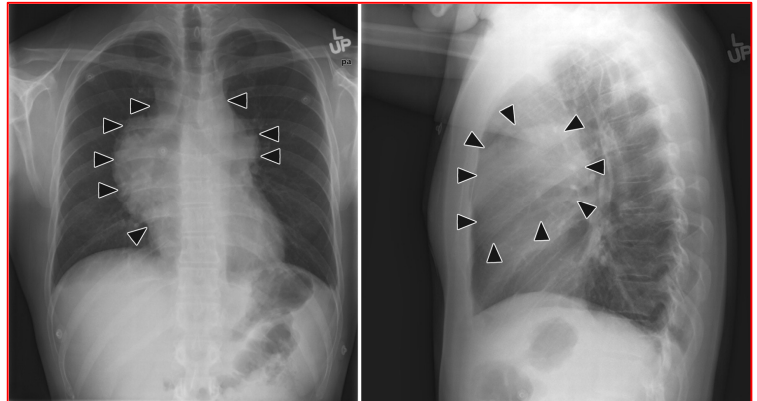
Pregnancy:-

- ♦ Maternal: placenta previa, abruption placentae
- ♦ Infants: higher perinatal mortality

M E D I A S T I N A L S Y N D R O M E

Aetiology:-

1. Aneurysm of the arch of aorta or one of its branches.
2. Cold abscess
3. Hiatus hernia
4. Intra thoracic goiter
5. Lymph adenopathy
6. Neurofibroma
7. Pericardial effusion
8. Teratoma
9. Thymoma
10. Tumours



Clinical picture:- pressure manifestations:

1. Pressure on tubes: (3)

A. Trachea & bronchi:

- ♦ Dyspnea:- Increased in supine position & the patient prefers the prayer's position.
- ♦ Brassy cough.
- ♦ Bronchia obstruction
 1. **Partial:-** Fixed localized wheeze then emphysema and/or bronchiectasis.
 2. **Complete :-** Collapse.

B. Oesophagus: Dysphagia & regurgitation.

C. Thoracic duct: chylous ascites, pericardial or pleural effusion

2. Pressure on nerves: (5)

A. Vagus or left recurrent laryngeal nerve:

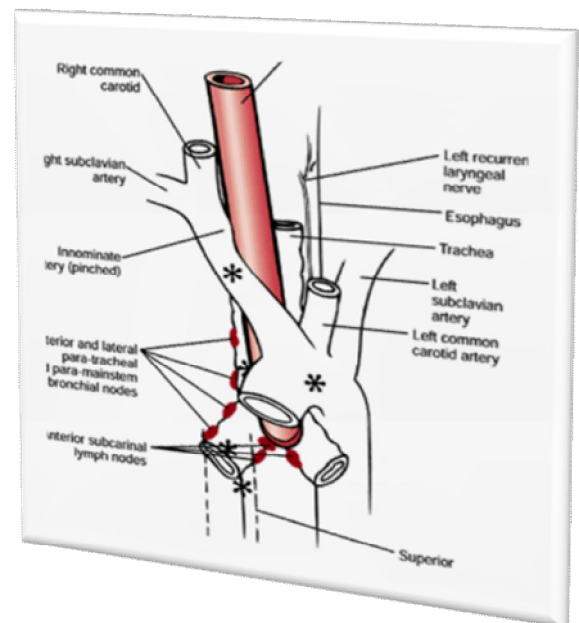
- ♦ Hoarseness of voice
- ♦ Stridor
- ♦ Bovine cough

B. Sympathetic chain : Horner's syndrome.

C. Brachial plexus : (lower trunk)

- ♦ Pain & paraesthesias along the medial aspect of the arm, forearm & hand
- ♦ Later on there is sensory loss
- ♦ Weakness & wasting of small muscles of the hand & flexors of the wrist.

D. Intercostal nerves : intercostals neuralgia



E. Phrenic nerve: diaphragmatic paralysis

3. Pressure on vessels: (3)

A. Superior vena cava:

- ♦ Congested non-pulsating neck veins
- ♦ Dilated veins on chest wall filling from above downwards.
- ♦ Oedema & cyanosis of the face, neck & upper limbs.

B. Azygos vein:-

- ♦ Dilated veins on chest wall filling from above downwards.

C. Branches of aortic arch e.g. -Sub-clavian artery:

- ♦ Unequal pulse & B-P- in the upper limbs
- ♦ Unilateral clubbing

4. Pressure on bones : (Ribs, sternum or spine)

- ♦ Bone pains, bone swelling or rarely fractures.

5. Manifestations of the cause.

Investigations:

Images:-

1. Chest X-ray : For detection of site, size & shape of mediastinal mass
2. Fluoroscopy:- Detects position & mobility of diaphragm.
Detects pulsations of an aneurysm
3. CT: Accurate for detection of site, size & nature of mediastinal mass.
4. Specific images:- Barium swallow, thyroid scan, venography, lymphangiography.

Endoscopy:

- ♦ Bronchoscopy
- ♦ Mediastinoscopy
- ♦ Thoracoscopy

Treatment:-

- Specific treatment usually surgical or interventional
- life support and symptomatic treatment **Before** surgery

S y m p t o m a t o l o g y

C o u g h

Definition:- Cough is a defensive mechanism aiming at expulsion of secretions or inhaled particles from the respiratory tract

Aetiology: (Reflex - Central - hysterical)

I- Reflex cough: Due to irritation of vagal receptors):

A- Respiratory causes

Causes	Features
1. Pharyngeal diseases: pharyngitis, tonsillitis, ulcers, tumours, post-nasal discharge.	Painful, non-productive ± nausea & vomiting
2. Laryngeal diseases: Foreign body, laryngitis, ulcers, tumours.	Paroxysmal, painful, barking ± hoarseness of voice or stridor.
3. Trachea- bronchial diseases ♦ Bronchiectasis ♦ Bronchial asthma ♦ Bronchial tumours ♦ Pressure as mediastinal syndrome	According to the cause + expectoration (see the table below)
4. Parenchymatous lung diseases: ♦ Pneumonias, abscess, T.B. ♦ Collapse, fibrosis, interstitial lung dis. ♦ Pulmonary infarction	
5. Pleural diseases: Pleurisy, effusion, pneumothorax, hydropneumothorax & pleural fibrosis.	Usually dry cough due to irritation exaggerated by activity and body movement.

Some types of expectoration (sputum):-

Frothy-(serous)	♦ Pulmonary oedema (pink frothy sputum) ♦ Pulmonary venous congestion ♦ Broncho alveolar carcinoma
Mucoid	♦ Chronic bronchitis ♦ Bronchial asthma
Purulent - mucopurulent	♦ Abscess and bronchiectasis ♦ Any form of broncho pulmonary infection
Rusty= Golden brown	♦ Pneumonia. (altered blood pigment)
Chocolate	♦ Amebic lung abscess (Anchovy Sauce)
Red – current jelly	♦ Bronchial carcinoma
Caseous	♦ TB = nummular sputum (coin like)
Black	♦ Inhalation of carbon

NB: Excessive eosinophils can cause sputum to appear purulent like (Yellow)

NB: Paroxysmal:- Whooping cough – Cavity syndrome – B.A. + Pharyngeal, laryngeal and auditory irritation.

B- Extra-respiratory causes

Cardiovascular diseases:

- ♦ Pulmonary congestion e.g. left ventricular failure & MS
- ♦ Pulmonary embolism
- ♦ Pressure: aortic aneurysm, massive pericardial effusion or huge left atrium.

Mediastinal diseases: Aortic aneurysm, tumour, L.N. retrosternal goiter

1. **Brassy:-** tracheal causes (metallic form = mediastinal synd.)
2. **Bovine:-** Lt. RLN paralysis (hollow).

Other causes:

Abdominal causes: e.g. subphrenic abscess

Meningeal causes: e.g. meningitis & subarachnoid haemorrhage.

Aural causes: e.g. otitis media or externa.

II- **Central cough:** Due to irritation of cough center.

Causes: Brain tumours, cerebrovascular strokes, encephalitis.

Features: Dry cough and neurological manifestations.

III- **Hysterical** (Psychogenic) cough: Usually in young females.

Dry & barking cough occurring in front of audience.

Complications of Chronic Cough (COPD)

<u>Thoracic</u>	<u>Extra thoracic</u>
1. Ms. (chest) pain	6. Eye puffiness
2. Fracture rib (stress fracture)	7. Subconjunctival hge.
3. Pneumothorax	8. Retinal detachment
4. Emphysems.	9. Subarachnoid or cerebral haemorrhage.
5. Haemoptysis	10. Hernia
	11. Rectal prolapsed
	12. Stress incontinence of urine
	13. Cough syncope
	14. Insomnia & exhaustion
	15. Dissemination of infection.

H a e m o p t y s i s

Definition :- Expectoration of blood it may occur in the form of blood-streaked, blood-tinged or frank haemoptysis.

Two types:

1. **True haemoptysis**: Bleeding originating from below the vocal cords.
2. **False or spurious haemoptysis**:- Bleeding originating from above the vocal cords.

Aetiology:

1. **Larynx: e.g.** laryngitis, foreign body, tumors, ulcers.
2. **Tracheobronchial:-**
 - ♦ Bronchogenic carcinoma
 - ♦ Bronchiectasis
 - ♦ Acute & chronic bronchitis.
 - ♦ Inhaled foreign body.
3. **Pulmonary:**
 - ♦ Infections :- Pulmonary tuberculosis.
 - ♦ Pneumonia
 - ♦ Massive pulmonary embolism
 - ♦ Vasculitis e.g. Wegener's granulomatosis.
 - ♦ Pulmonary haemosiderosis
 - ♦ Lung abscess
 - ♦ Aspergilloma
 - ♦ Trauma
 - ♦ Goodpasture's syndrome
 - ♦ Pulmonary A-V malformation
4. **Cardiovascular causes:**
 - ♦ Pulmonary congestion: due to left-sided heart failure.
 - ♦ Pulmonary oedema
 - ♦ Severe hypertension.
5. **Systemic causes:**
 - ♦ Haemorrhagic blood diseases as purpura & haemophilia.

Differential diagnosis:

I- Haemoptysis & haematemesis:

	<i>Haemoptysis</i>	<i>Haematemesis</i>
<i>Past history</i>	Chest or heart disease	GIT or hepatic disease
<i>Before attack</i>	Cough	Nausea & vomiting
<i>Blood</i>	Bright red & frothy	Dark red & food particles
<i>After attack</i>	Blood-streaked sputum	Melena
<i>Examination</i>	Chest signs	Abdominal signs
<i>investigations</i>	Chest or heart disease	GIT or hepatic disease

II- True or false haemoptysis:

Examination of upper respiratory tract usually reveals the cause of false haemoptysis.

Approach for haemoptysis:

A. Full clinical evaluation: including history taking & physical examination.

B. Investigations:

1. Chest X-ray.
2. Sputum examination
3. CT chest
4. Bronchoscopy
5. Bronchography.
6. Cardiac investigations: ECG & echocardiography.
7. Investigations for haemorrhagic blood diseases.

Treatment:

1. Treatment of the cause
2. Treatment of massive haemoptysis require
 - ♦ Hospitalization & rest in bed
 - ♦ Blood transfusion & anti shock measures.
 - ♦ Control of bleeding : e.g. (vit r, IV)
 - ♦ Radiotherapy in bronchial tumours.
 - ♦ Collapse therapy in T.B. (obsolete)

D y s p n e a**Aetiology:-****I- Cardiovascular diseases:**

- ♦ Pulmonary congestion : e.g. MS & left ventricular failure
- ♦ Massive pulmonary embolism & pulmonary infarction
- ♦ Massive pericardial effusion.

II- Respiratory diseases:**Laryngeal causes:**

- ♦ Inhaled foreign body, tumours, laryngeal spasm, oedema or paralysis

Trachea – bronchial causes:

- | | |
|--|--|
| <ul style="list-style-type: none"> ♦ Chronic obstructive lung disease ♦ Bronchial asthma ♦ Bronchiectasis | <ul style="list-style-type: none"> ♦ Inhaled foreign body or secretions |
|--|--|

Lung causes:

- | | |
|---|--|
| <ul style="list-style-type: none"> ♦ Consolidation ♦ Collapse ♦ Fibrosis | <ul style="list-style-type: none"> ♦ Bronchial tumours ♦ Interstitial lung diseases. ♦ ARDS |
|---|--|

Pleural causes:

- ♦ Pleurisy, effusion, pneumothorax, hydropneumothorax & pleural fibrosis.

Chest wall & abdominal causes:

- ♦ Extreme obesity
- ♦ Kyphoscoliosis
- ♦ Ankylosing spondylitis
- ♦ Fractured ribs
- ♦ Abdominal distension e.g. marked ascites & huge tumours

III- General diseases:

- ♦ Anaemia, thyrotoxicosis & other causes of hyperdynamic circulation
- ♦ Haemorrhage & shock
- ♦ Acidosis

IV- Neurological diseases:

- ♦ Vocal cord paralysis
- ♦ Diaphragmatic paralysis
- ♦ Peripheral neuropathy
- ♦ Myasthenia graves & myopathy.
- ♦ Poliomyelitis affecting respiratory muscles.

V- Psychogenic (Hysterical) dyspnea**Causes of acute dyspnea**

- ♦ Acute left-sided heart failure e.g. MI
- ♦ Pulmonary embolism
- ♦ Inhaled foreign body, laryngeal spasm or oedema.
- ♦ Bronchial asthma & extrinsic allergic alveolitis.
- ♦ Pneumonia, ARDS, massive lung collapse.
- ♦ Pleurisy, pneumothorax
- ♦ Hysterical
- ♦ Haemorrhage, acute acidosis.

C H E S T P A I N**Aetiology:*****I- Cardiovascular disease:***

- Ischaemic heart disease (angina pectoris & myocardial infarction)
- Pericardial disease (dry pericarditis & massive pericardial effusion)
- Massive pulmonary embolism & pulmonary infarction
- Aortic dissection & aortic aneurysm.
- Cardiac neurosis
- Huge cardiomegaly may rarely cause retrosternal heaviness.

II- Respiratory Diseases:

- Pleurisy, pleural effusion (empyema), pneumothorax, hydropneumothorax & pleural tumours.
- Massive pulmonary embolism & pulmonary infarction
- Lung diseases extending to the pleura e.g. pneumonia, lung abscess.
- Acute massive lung collapse.
- Central bronchial carcinoma = Tracheitis.

III- Mediastinal Diseases:

- Oesophageal causes : Oesophageal spasm, GERD, oesophagitis & cancer.
- Lymphadenopathy ▪ Mediastinal emphysema.
- Mediastinal tumours ▪ Mediastinitis

IV- Chest wall Diseases:

- Skin : wound, infection or tumour
- Breast: Mastitis, abscess or tumour
- Ribs:- Fracture, osteomyelitis or tumour
- Tietze's syndrome, slipping rib syndrome
- Intercostals muscles : Muscular strain (e.g. with severe cough) or myositis.
- Intercostals nerves: Herpes zoster, radicular pain or neuritis.

V- Abdominal Diseases:

- Gastritis, P. ulcer and hiatus ▪ Amoebic liver abscess or hernia subphrenic
- Gall bladder disease ▪ Peritonitis.

Causes of acute chest pain:

1. Ischaemic heart disease: Angina pectoris and acute myocardial infarction.
2. Acute pleurisy and acute pericarditis.
3. Massive pulmonary embolism and pulmonary infarction
4. Aortic dissection 6. Pneumothorax
5. Acute massive lung collapse 7. Herpes zoster
8. Oesophageal spasm, oesophagitis & oesophageal rupture
9. Mediastinal emphysema.

SLEEP APNEA SYNDROMES**Types:**

1. Obstructive: due to obesity
2. Central: Due to genetic defect of respiratory drive
3. Combined

Clinical Presentation:

- Insomnia at night & sleepiness at daytime
- Apneic attacks occur up to 300 times per night
- Snoring
- Condition is aggravated by sedatives given for treatment of insomnia
- Cyanosis may occur
- Complications: arrhythmias, death.

Treatment:-

- Observation - Weight reduction -Airway prosthesis

PULMONARY EMBOLISM

Types and Source of Emboli:

I- Thrombo-emboli:

A- Peripheral veins: Deep venous thrombosis (DVT)

Predisposing factors (virchow's triad) include:

1. Slow circulation:

- Prolonged rest in bed
- Heart failure
- Obesity
- Pregnancy

2. Hypercoagulability:

- Polycythaemia
- Dehydration
- Post-operation
- Post-traumatic
- Post-partum
- Pregnancy
- Contraceptive pills
- Malignancies
- Lupus anticoagulant

3. Injury of vascular endothelium:

- inflammation
- Trauma

B- Right side of the heart:

- Vegetations of infective endocarditis
- Mural thrombus over myocardial infarction
- Arrhythmias esp. AF.

C- Paradoxical embolism:

- Embolus passing from left side of heart through a defect (e.g. VSD or ASD) to right side of the heart.

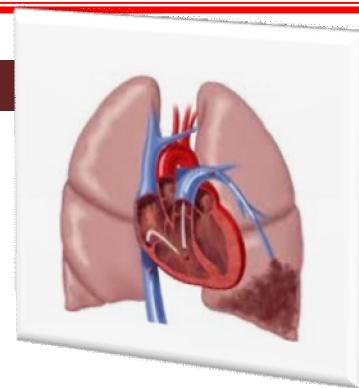
II- Other types of emboli:

Fat, air, amniotic fluid, foreign material, parasitic or malignant cell emboli.

Clinical Picture:-

Presentations of pulmonary embolism are variable depending of :

- Size of embolus
- Number of emboli
- Underlying lung disease
- Whether the embolus is infected or not.



A- Minute embolus:-	B- Medium – sized embolus:	C- Big embolus
- Asymptomatic - Recurrent minute emboli:- may cause thromboembolic pulmonary HTN & Subacute or chronic cor pulmonale	- Causes Pulmonary infarction - If occlusion involves <65% of pulmonary vascular bed	- Massive pulmonary embolism - Occlusion involves 65-85% of pulmonary vascular bed
<u>Clinical Picture:</u> of A - B - Sudden pleuritic stitching chest pain - Dyspnea, cough & haemoptysis - In the second day fever & jaundice may occur - Pleural rub or haemorrhagic pleural effusion may be present. - There may be features of DVT. 		- Chest pain: sudden severe retrosternal pain - Dyspnea, manifestations of low CO & may be cyanosis - Rapid appearance of manifestations of pulmonary hypertension & right ventricular failure (acute cor pulmonale). - Cardiogenic shock may occur - There may be features of DVT.
<u>Differential Diagnosis:-</u> - Causes of acute chest pain - Causes of haemoptysis		- Causes of acute chest pain, severe dyspnea, acute heart failure & shock e.g. 1- Extensive myocardial infarction 2- Tension pneumothorax 3- Massive lung collapse - Sudden death :- (If occlusion involves >85% of pulmonary vascular bed) Also, infected embolus may lead to pneumonia & lung abscess.

Investigations:**1- Chest X-ray:**

- Wedge-shaped opacity may be detected
- Later, it may leave a linear opacity
- Pleural effusion
- Dilatation of proximal pulmonary artery.
- Areas of oligoemia.

2- ECG:

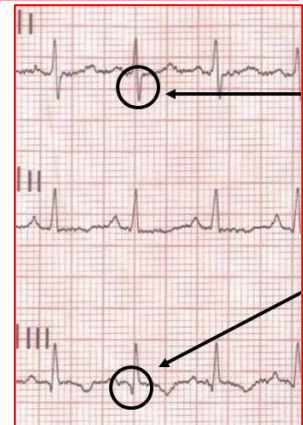
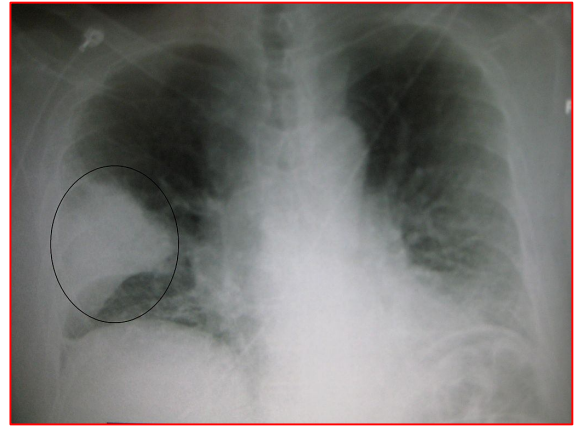
- S1 Q3 pattern.
- Right ventricular strain

3- Arterial blood gases: Hypoxia & hypocapnia**4- Laboratory tests:**

- Increased serum indirect bilirubin
- Increased serum LDH
- SGOT is normal

5- Perfusion lung scan : Using TC macroaggregated albumin

- Ventilation – Perfusion scan is more accurate in diagnosis

6- Pulmonary angiography : the most specific test.**7- Investigations for diagnosis of DVT****Treatment:****I- Prophylactic:**

- Prophylaxis and treatment of predisposing factors of embolism.
- Early post-operative and post-partum ambulation.
- Prophylactic anticoagulation in susceptible patients by heparin 5000 units/8 hours SC.

II- Therapeutic :**Hospitalization: Preferably in ICU.****If the patient is haemodynamically unstable:**

(i.e. in the presence of shock or heart failure)

a) Thrombolytic therapy:

- Using streptokinase, urokinase or tissue plasminogen activator given intravenously or intra- pulmonary.
- Streptokinase is given as follows: 250,000 – 500,000 IU IV bolus followed by 100,000 IU/hour for 24-72 hours continuous IV infusion.
- This is followed by anticoagulation using:-
 1. Heparin IV for 5 days
 2. Heparin & oral anticoagulants e.g. Warfarin for 5 days.
 3. Warfarin for 3 months at least.

- b) **Pulmonary embolectomy**:- (*Trendlenburg's operation*) performed in some cases when thrombolytic therapy is contraindicated.

If the patient is haemodynamically stable:

Further thrombosis and embolizations is prevented by:

- a) **Anticoagulation:**
 1. Heparin IV for 5 days
 2. Heparin & oral anticoagulants e.g. Warfarin for 5 days.
 3. Warfarin for 3 months at least.
- b) **Inferior vena cava interruption:**
 1. Indicated when anticoagulants are contraindicated or ineffective.
 2. Performed using IVC ligation, clipping or by insertion of filter or umbrella.

Symptomatic treatment:

- Analgesics e.g. pethidine 50 mg IV or IM
- Morphine should be avoided because of its respiratory depressing effect
- Oxygen inhalation
- Mechanical ventilation may be required in severe cases

Treatment of complications e.g.

- Shock
- Right ventricular failure
- Correction of the predisposing factors of thrombo-embolism.

Drug induced lung disease:-

Bronchospasm	- B blockers. - NSAIDs
Cough	-ACEIs
Pleural effusion	- Amiodarone - Methotrexate - Phenytoin - INH - Hydralazine
IPF	- Amiodarone - Methotrexate
Res. C. suppression	- Sedatives - Opiates.
ARDS	- Prolonged O2 therapy - Opiates

Sarcoidosis

Definition:- Granulomatous disease affecting lungs, lymph nodes and/or any organ.

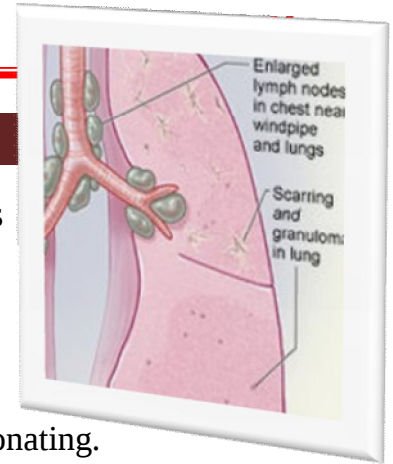
Clinical picture:- as IPD + Extra - Pulmonary manifestation

Gradual progressive **dyspnea**

Cough - Central Cyanosis - Clubbing

Crepitations:- late or pan-inspiratory medium-sized, non-consonating.

Complications:- Respiratory failure - Cor pulmonale



Extra - Pulmonary manifestation:-

Liver:- hepatomegaly - jaundice - hepatic dysfunction

Skin:- erythema nodosum

Eye :- uveitis, uveoparotitis,

Neurology:- All components can be involved, commonest in polyneuropathy and cranial nerves affection

Blood:- Anemia and may be Leukopenia

Neoplastic progress:- Lung cancer or lymphoma

Investigations:- as IPD + Extra - Pulmonary manifestation

1- Chest X-ray: four stages

Stage 1: bi-hilar lymphadenopathy (**BHL**)

Stage 2: **BHL** and reticulonodular infiltrates

Stage 3: Bilateral pulmonary infiltrates

Stage 4: Fibrocystic

2- Pulmonary function tests: AS IPDs

3- Specific:-

- Histo-pathological:- (non caseating granuloma)

Biopsy:- CT-guided, mediastinoscopy, open lung biopsy, bronchoscopic, FNA of mediastinal LN. extra-thoracic LN biopsy

Bronchoalveolar lavage:- for disease activity

- Angiotensin-converting enzyme :-elevated (for monitoring)

- Intradermal test (kviem):- not used now



Treatment: as treatment of IPDs

1-Specific:-

_ Steroids: **prednisone 1 mg/kg/d.**

_ Steroid-sparing agents such as azathioprine and methotrexate

2- Symptomatic treatment: e.g. oxygen therapy.

3- Treatment of complications:- Pulmonary infections - Respiratory failure

4- Lung transplantation is the only therapeutic option available in severe case

C a r c i n o i d t u m o r

Definition:- is a slow-growing type of neuroendocrine tumor.

Clinical pictures and types according to origin of tumor

A- GIT:- Midgut (jejunum, ileum, appendix, and cecum) usually associated with carcinoid syndrome.

B- Lung:- as bronchial adenoma - usually associated with right sided valve lesion

Carcinoid syndrome:- (triad of flush, diarrhea and abdominal cramp)

- Flushing
- Lung:- Cough or wheezing
- GIT:- Diarrhea- Abd. cramps
- CVS:- Pulmonary and tricuspid lesion

Investigation :

- 24 hour urine levels of 5-HIAA (5-hydroxyindoleacetic acid)
- Imaging :- Lung x-ray, Ct-scan or MRI
- GIT endoscopy

Treatment:-

- Octreotide (a somatostatin analogue)
- Radionuclide therapy:- lutetium-177, yttrium-90 or indium-111
- Cyproheptadine (an antihistamine drug with antiserotonergic effects)
- Surgical resection and/or chemotherapy.

